

REPORT

OF THE

DIRECTOR OF THE MINT

UPON THE

STATISTICS OF THE PRODUCTION

OF THE

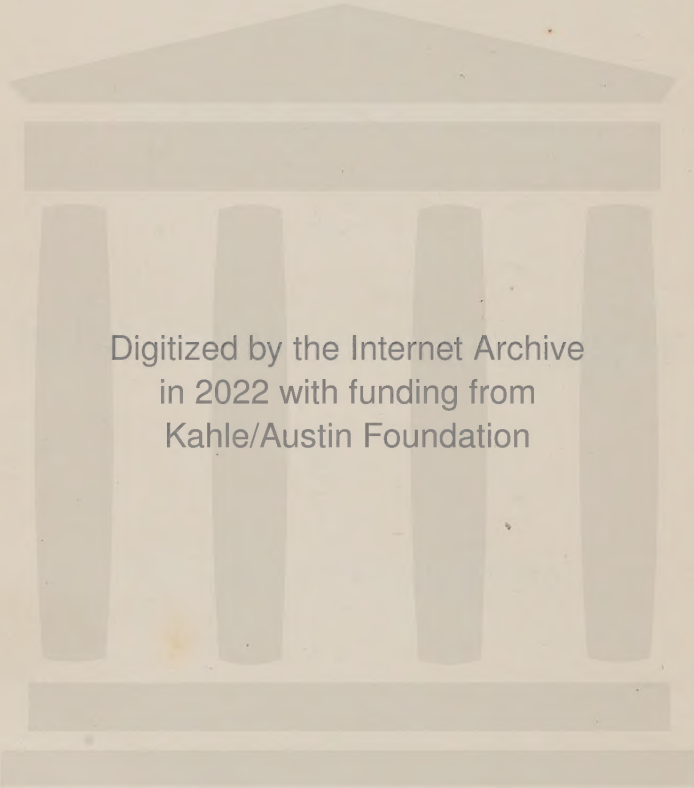
PRECIOUS METALS

IN THE

UNITED STATES.



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1881.



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LETTER

FROM

THE SECRETARY OF THE TREASURY,

TRANSMITTING

A report from the Director of the Mint upon the statistics of the production of the precious metals in the United States.

MARCH 2, 1881.—Laid on the table and ordered to be printed.

TREASURY DEPARTMENT, *March 2, 1881.*

SIR: I have the honor to transmit herewith the report of the Director of the Mint upon the statistics of the production of the precious metals in the United States.

Very respectfully,

JOHN SHERMAN,
Secretary.

HON. SAMUEL J. RANDALL,
Speaker of the House of Representatives.



LETTER OF TRANSMITTAL.

TREASURY DEPARTMENT, }
Document No. 144.
Bureau of the Mint. }

TREASURY DEPARTMENT,
BUREAU OF THE MINT,
Washington, D. C., March 2, 1881.

SIR: I have the honor to submit the following report upon the statistics of the production of the precious metals in the United States. The appropriation of \$5,000 for the collection of these statistics, to be expended under your direction, became available at the commencement of the current fiscal year, and the work was soon afterwards assigned to the bureau of the Mint.

The total production of gold and silver in the United States and the probable yield of the mines of each State and Territory have been annually estimated by the Director of the Mint and published in his reports. These statements have been based upon information obtained from officers of the mints and others in the mining regions, and upon statements of depositors as to the locality of production of the gold and silver received at the various mints and assay offices. From these incomplete data approximate estimates have been annually made, which, although probably inaccurate in many details, have been found exceedingly useful for statistical purposes.

The Mint Bureau through its subordinate institutions possesses unusually excellent facilities for obtaining such information, as during the last fiscal year nearly all the gold produced by the mines of the country was deposited at the mints and assay offices and exchanged for coin or bars, and of the silver produced in the United States more than three-fourths was purchased by the government for coinage or deposited for bars. The depositor or seller himself furnished the locality of production of nearly half of the gold and about one-third of the silver deposited or purchased, the balance being from unknown localities.

To ascertain the State or Territory in which the latter was produced, it became necessary to employ other means and look elsewhere for information. This information has been sought, both by letter or personal interview, from mine and mill owners, smelting, refining, and reduction works, banks and bullion brokers, express companies, railroad and freight agents, and custom-houses. The information thus obtained, while incomplete in detail from any one source, has been of great value as a means of comparison and arriving at general results. Six refining and reduction works alone, east of the Rocky Mountains, treated more than half of the silver product of the country.

It was deemed advisable to assign to mint officers, or other compe

tent persons in the mining regions, the territory in their immediate vicinity, with instructions to procure from the officers, agents, and owners of mines, mills, and reduction works as full and detailed information as possible, while the statistics of the amount of gold and silver ore and bullion treated at or transported to other refineries and placed upon the market and exported was left to be ascertained under the immediate direction of this office.

To the superintendent of the mint at San Francisco, Mr. H. L. Dodge, was assigned the special task of collecting statistics and other information relating to mining subjects in California, Idaho, Oregon, Washington, Nevada, and Arizona, and he detailed Mr. A. M. Lawver, an employé of his mint, to attend specially to obtaining the desired information, whom Mr. Dodge reports manifested signal skill and was very successful in obtaining a vast amount of valuable information which was condensed into summary statements relating to each State and Territory of the Pacific coast, and forwarded to this office, accompanied also by special articles from Messrs. Skidmore and Yale relating to the production and methods of mining and treatment of the precious metals.

The Territory of Montana was given to Mr. R. B. Harrison, assayer in charge of the United States assay office at Helena. Mr. J. E. Dooly, agent for Wells-Fargo Express Company at Salt Lake City, kindly undertook to furnish the necessary information respecting Utah, and has forwarded a summary statement of the production of that Territory which appears under the appropriate head.

Mr. H. Silver, assayer in charge of the Denver mint, was instructed to procure the statistics of production in Colorado and New Mexico. Dakota was reached through circular letters from this bureau, aided by Mr. S. N. Wood, cashier of the First National Bank at Deadwood, and Mr. G. B. Hanna, of the United States assay office at Charlotte, N. C., examined the mines of North Carolina and South Carolina and Georgia as thoroughly as the limited time at his command since the work was assigned him would permit.

The statistics of the shipment of ores and base bullion, so far as I have been able to obtain the same, were procured by correspondence or personal interview with Mr. E. M. Morseman, general manager of the Pacific Express Company; Mr. J. F. Goddard, general freight agent of the Atchison, Topeka and Santa Fé Railroad, and Mr. M. H. Goble, general freight auditor of the Union Pacific Railroad.

Messrs. E. W. Nash, secretary and treasurer of the Omaha Smelting and Refining Company; G. H. Loker, jr., secretary of the Saint Louis Smelting and Refining Company; George W. Platt & Co., of New York; H. R. Wolcott, manager of the Boston and Colorado Smelting Company; E. Balbach & Son, of the Newark Smelting and Refining Works, and E. F. Eurich, superintendent of the Pennsylvania Lead Company's works at Mansfield, Pa., furnished not only the amount of bullion produced by their respective works, but stated the localities from which the ore or base bullion was received.

PRODUCTION FOR THE FISCAL YEAR 1880.

In my last report as Director of the Mint, I estimated the production of the precious metals in the United States during the fiscal year 1880 to have been \$36,000,000 in gold and \$37,700,000 in silver. Since that report was submitted a vast amount of additional information has been received, much of it in its details as to the production of individual

mines being confidential, but valuable in ascertaining the gross production of the various mining sections. From a careful comparison and analysis of all the information received from every source, I find that my estimate of \$36,000,000 for gold is sustained. The value of the silver produced during the same period, computed at its coin value, I estimate at \$39,200,000 which exceeds the estimate submitted in my report as Director by \$1,500,000.

The silver bullion purchased during the fiscal year for coinage amounted to 24,262,571 standard ounces, worth at its coining value \$28,232,810. The deposit of silver coin and bullion, not of domestic production, was \$2,507,766, of which probably \$2,000,000 was purchased and used for coinage. I estimated that \$4,000,000 was used in manufactures. Custom-house returns give the export of domestic silver bullion as \$6,912,864, which, being the commercial value, should be computed at its coining value of \$7,880,654. These aggregate in round numbers as follows :

Used in coinage.....	\$26,200,000
Used in arts	4,000,000
Exported	7,900,000
Total	38,100,000

This must be considered as the total value of the silver produced during the fiscal year if no more than \$4,000,000 of domestic silver was used during that period in the arts and manufactures, and if the stock of bullion in the hands of bankers awaiting sale or shipment had not increased. Probably there had been some accumulation, as the exports during the last four months of the fiscal year were lighter than the average monthly amounts. Without any specific information upon this point, I am inclined to believe that such had been the case, as the estimated consumption of \$38,100,000 does not account fully for the production ascertained from the reports received by this bureau.

The eastern refineries report a round sum of \$21,700,000 as having been refined during the fiscal year, and in that time the assay office at New York and Mint at Philadelphia refined \$3,000,000 of domestic bullion. A prominent bullion dealer in New York reports exporting from that port \$2,200,000 in coarse silver bars, as received from their locality of production; there was purchased for coinage at the mints at San Francisco and Carson over \$8,500,000, and the exports of domestic bullion at the port of San Francisco amounted at their coining rate to \$5,300,000. These several amounts aggregate as follows :

Refined at eastern refineries	\$21,700,000
Refined at Philadelphia Mint and New York assay office	3,000,000
Exported from New York.....	2,200,000
Purchased at San Francisco and Carson.....	8,500,000
Exported from San Francisco	5,300,000
Total	40,700,000

This latter amount is doubtless too high, as it embraces bars from private refineries that must have been subsequently further refined by the government, and mint bars previously made and included in the amount purchased during the year for the western mints. I therefore submit my estimate of the production of silver at \$39,200,000, and the more confidently as it is corroborated in its details by reports received from the various States and Territories.

The following presents a detailed estimate of the several amounts of gold and silver produced by each State or Territory during the fiscal year:

State or Territory.	Gold.	Silver.	Total.
Alaska	\$6,000		\$6,000
Arizona	400,000	\$2,000,000	2,400,000
California	17,500,000	1,100,000	18,600,000
Colorado	3,200,000	17,000,000	20,200,000
Dakota	3,600,000	70,000	3,670,000
Georgia	120,000		120,000
Idaho	1,980,000	450,000	2,430,000
Montana	2,400,000	2,500,000	4,900,000
Nevada	4,800,000	10,900,000	15,700,000
New Mexico	130,000	425,000	555,000
North Carolina	95,000		95,000
Oregon	1,090,000	15,000	1,105,000
South Carolina	15,000		15,000
Utah	210,000	4,740,000	4,950,000
Virginia	10,000		10,000
Washington Territory	410,000		410,000
Wyoming	20,000		20,000
Other	14,000		14,000
Total	36,000,000	39,200,000	75,200,000

PRODUCTION FOR THE CALENDAR YEAR 1880.

From the amount deposited at the mints and operated upon at various refineries and smelting works in the United States, as well as from information thus far received as to the amounts carried by express, railroads, and produced by the reports from the mines themselves, the production for the calendar year 1880 does not appear to have varied much from the amount yielded by the mines of the country during the fiscal year.

The deposits of domestic bullion at the mints and assay offices were: Gold \$35,372,452.85, and silver, \$32,845,176.98, being a deposit of \$449,350.55 less of gold, and \$712,420.03 more of silver than during the fiscal year. The exports during the calendar year were: Gold, \$79,183, and silver, \$7,753.856.

The deposits not of domestic production were, of gold, \$64,905,748.35, making the total deposits of gold bullion \$100,278,203.20. The deposits of silver not of domestic production were \$2,560,274.02, the total deposits and purchases \$35,405,451. The purchases at the mints and assay offices of silver for coinage during the year amounted to 24,659,599.63 standard ounces, which was valued at \$28,694,806.84, and estimating that \$2,000,000 of the foreign silver was used in coinage, would leave \$26,694,806.84 of the domestic production used for coinage, giving an aggregate of—

Coinage	\$26,700,000
Arts	4,000,000
Export	7,750,000
Total	38,450,000

This shows a disposition of silver bullion during the calendar year exceeding the amount used for the same purposes during the fiscal year by about a quarter of a million of dollars.

As, however, the returns from smelting works, refineries, and other sources of information for the last six months are incomplete and fuller information may be expected, and stocks of silver bullion may have

accumulated on the seaboard to some extent in the hands of dealers; I am not prepared to make a definite estimate of the production for the calendar year other than to say it somewhat exceeds that of the fiscal year. The returns thus far received are not sufficiently specific to enable me to give a reliable estimate at this time of the production of each State and Territory, but they indicate an increase in the yield of the mines of Arizona and Dakota, a decrease in Nevada, while that of California and Colorado, the two largest producing States, remains at about the same.

In the collection of these statistics I have been ably seconded, not only by those already mentioned, but by many other gentlemen whose experience in mining affairs render their statements reliable.

Prof. Thos. Egleston, of the School of Mines of Columbia College, presents a translation of the gold and silver parting process in Lauen-thal by B. Rösing, and also a description of the same process as used in California.

Mr. Walter A. Skidmore, of San Francisco, who was for a number of years the deputy in California of Prof. R. W. Raymond, formerly United States Commissioner of Mining Statistics, has contributed valuable dissertations on the production of the precious metals in his State, which will well repay perusal and study. Mr. C. G. Yale, editor of the Mining and Scientific Press, of San Francisco, and a gentleman abundantly qualified to furnish accurate information, has supplied much useful and interesting material. Messrs. J. J. Valentine, Thos. Price, F. Berton, C. P. Gordon, A. W. Havens, and the Selby Refining Works, all of San Francisco, have aided materially with statements of production or bullion handled.

My thanks are due, also, to Messrs. D. Van Lennep, Plumas County, California; George H. Parsons, Colorado Springs, Colo.; J. E. Gignoux, Dayton, Nev.; and A. F. Schneider, Salt Lake City, Utah; also to the gentlemen of the Mint Bureau, Mr. Frederick Eckfeldt, who has had special charge of this division of labor, and to Messrs. Leech and Preston, who have aided, both during and after office hours, in compiling and arranging information that has been received.

I have the honor to be, very respectfully,

HORATIO C. BURCHARD,

Director of the Mint.

HON. JOHN SHERMAN,
Secretary of the Treasury

STATISTICS OF THE PRODUCTION OF GOLD AND SILVER IN THE RESPECTIVE STATES AND TERRITORIES FOR 1880.

CALIFORNIA.

Very complete statistics have been gathered in regard to the production during the year from the different mining districts in the State of California, aggregating more than five-sixths of the total production of the State. They have been tabulated and arranged by counties, under the direction of the superintendent of the San Francisco mint, with the addition of such further information as has been received at this office. The \$1,500,000 additional of estimated production for the State could not be distributed, because for some counties the figures are approximately accurate, while for others considerable additions must be made to the reported production on account of mines from which no returns have been received. The total production of the State is estimated at \$17,500,000 gold and \$1,100,000 silver.

ALPINE COUNTY.

Its mining condition continues as described by Mr. Raymond in his report of 1870. The topography of the country necessitates almost universally the employment of adits. This expensive and slow manner of reaching a possible find deters the impecunious miner from attempting work; and the rebellious nature of the ores rendering them so difficult to treat is a further and a still greater discouragement.

Markleeville and Monitor, in the northern part of the county, are the centers of chief mining industry, but very little has been produced and no new discoveries have been made in this vicinity. There being no mills or smelters here, is a further discouragement.

At Monitor, the Colorado No. 2 Mining Company is the leading one in the district. It and several other mines situated upon the Monitor Mountain are destined to be large producers when properly developed. Thus far the Colorado No. 2 has worked through a tunnel 200 feet above the cañon drainage, and has taken its ore from that and the grass roots. No croppings are visible in its present workings, while further on in the direction of the main tunnel are immense croppings, showing gold ore at the surface. This discovery, made very recently, is considered as an indication that all the ore formerly taken from the mine has been from the offshoots of the main ore bodies.

The Advance mine, which joins the Colorado on the south, is considered equally promising. The Colorado has a mill of twenty stamps and the Advance one of ten stamps. These are the only mills in the district. Many promising claims are held by men of small capital. They are worked just enough to retain them under the provisions of the law.

One mine, however, the Lincoln, has been continuously worked for the past eighteen months, but has not yet reached its ledge.

The discovery of a gold and silver bearing ledge of base metal ore is reported near Summit City. The ledge is 20 feet wide, and at a depth of 200 feet the ore assayed \$600. There are no Chinese known to be at work in this county.

But one mine has reported, which shows a production of gold, \$17,113; silver, \$24,146; total, \$41,259.

AMADOR COUNTY.

This county differs from those both to the north and south, in that its mining industry is confined at the present almost entirely to quartz, comparatively only an insignificant amount of gravel mining being done. It has two systems of ledges traversing it from north to south: one at or near the point of contact of quartz and slate, known as the Mother Lode, the other higher up in the granite formation, the principal quartz mines being in the former at Amador City, the oldest quartz mining location in the county, and one of the earliest in the State; the yield of the mines is very large and regular. The group of mines in the south bank of Amador Creek, of which this mine was the nucleus, are consolidated under the name of the Keystone Company, which is the largest producer in the county, and one of the heaviest in the State. This mine has recently been retimbered and its mill thoroughly overhauled and repaired, and is now in full running order.

Mr. P. W. Mitchell has machinery in full blast for extracting sulphurets from slum and tailings, operating on the tailings of the Keystone and the Original Amador, dumped in the creek, which promises to be very successful.

Improvements are going on in the Bunker Hill with a view to adding another 20-stamp mill, and powerful hoisting machinery is soon to be placed in position. Everything is prosperous both at mine and mill.

The Gover mill has lain idle for some time, and it is uncertain when it will start up again.

In the Amador King the shaft has been enlarged and hoisting works are being erected. This mine reports the development of very rich rock as the shaft is sunk.

The South Spring Hill Mining Company have their new pump and boiler at work upon their claim near Amador City.

The Dan McKay mine has been sold to eastern capitalists. Much prospecting is being done about the city. At Sutter Creek are the three great mines, Consolidated Amador, Lincoln, and Mahoney. The former ranked for many years the leading quartz mine of the State, and is one of the oldest and deepest worked mines in the county, and is now taking out sufficient low-grade ore to run its 40-stamp mill. A new shaft is now being sunk in this mine to reach a depth of 150 feet by Christmas.

The Lincoln is still one of the chief mines in the county. The Mahoney is about completing a 40-stamp mill. Its ore has been milled at the Lincoln mill, but when its mill is completed then 40-stamp mills will be at work at this place.

At Volcano a new impetus has been given to mining by the renewal of quartz interests, and some half dozen mines are turning out bullion in satisfactory amounts.

The Douns mine, which was worked many years ago and thought to be exhausted, is now being developed under the auspices of its present

owner, Hon. R. C. Donns, who has just completed a 20-stamp mill with all modern improvements, which is said to be one of the best in the county.

The Volcano Gold Quartz Manufacturing Company and the Fogus Mill and Manufacturing Company are making improvements and meeting with success in their mines. The Golden Gate is now working to its fullest capacity. A rich strike is reported in the old Sorocco mine.

The Volcano Gold Gravel Mining Company is one of the most extensive gravel mines in the State. It is now about ready to add from the auriferous gravel deposits of the Volcanic basin its pro rata to the circulation of the country. But 60 feet of rock remains yet to penetrate in the great turn out, which will drain the basin 45 feet lower than it has been worked. Hundreds of acres of valuable mining lands will be drained by this enterprise.

In Pioneer district, above Volcano, the Modoc is again taking out ore from a fine body which has been struck, and the prospect of its becoming a good paying mine is most excellent.

The tunnel is being opened in the Pioneer mine, and work is being pushed in the Seaton.

Two arastras have been built on the creek below the Empire tail race to grind the sand that comes from the mill. Many prospectors are at work here, and the camp is in a lively condition.

At Jackson, in the southern part of the county, there is at present considerable activity in prospecting for new locations and in developing old ones.

The Zeila mine is located on one of the largest ledges in the State, the work being done on a 600 foot level, and consists of cross-cuts and drifts to more fully develop the ore body. Its new 20-stamp mill is unquestionably one of the best in the State.

In the Kennedy only prospecting has been done for some time, and we learn that a body of unusually rich ore has been reached in a new shaft very recently.

In the Kearsing the shaft is being retimbered and cleaned out, with the prospect of working a fine ledge of good quality.

About two miles east of Jackson is a pocket mine, owned by Mr. Wm. De Witt, in which several rich strikes have been recently reported. Near Plymouth is the Empire gold mine, the second mine in the county, and ranking, with the Keystone Consolidated, among the great mines of California.

On the same belt lies the Pacific, which has, through extensive explorations and practical working for a series of years, now proved to possess ore of a high value, yielding ample returns. The shaft in the mine is now down 370 feet. The new hoisting machinery is being erected, and a very fine double engine is being placed in position.

The Gladstone is being vigorously prospected with a good outlook ahead. At Drytown the old California mine has changed hands, and also its name to that of Potosi. The new company has repaired the mill, which is one of the latest improved Hendy's Pans and of 10 stamps, with a capacity of 20 tons of rock in twenty-four hours. Its rock averages \$87 per ton. The ledge is 4 feet wide. Four miles below Drytown is Pleasant Valley, formerly known as Starvation Flat, at which place great excitement has been caused by the striking of rich gravel diggings on Dry Creek, opposite the mouth of Spanish Gulch. The expense of locating a claim is trifling and the ground is easily worked. At Oleta the Jupiter Quartz mine has changed hands, and its present owners intend to erect hoisting-works and a 20-stamp mill, and make

other improvements with the view of making this one of the leading producers in the county.

A ditch eight miles long has been made to carry water from the El Dorado Canal to the Patterson Gravel Claim, near Oleta.

A four-foot quartz ledge has been found in the middle of the town, which prospects well. Mr. C. McLane is starting a gravel claim at Indian Diggings near Oleta.

At Fiddletown Mr. R. B. Wright is opening a quartz lode which is very rich, and there are other veins in the vicinity now prospecting with encouraging success, but additional capital is very much needed to fully develop them.

Ione.—Here there are many valuable ledges, supposed to be as good as any in the State, mostly owned by non-residents, which, when developed, will show an astonishing yield of bullion. The placer mines of township No. 2, which are considerable, are thronged with Chinese, and in almost every gulch and ravine along the western boundary of the county that lies between Irish Hill and Lancha Plana may be heard the clank of the Chinaman's pick. The Chinese produced, at Ione, \$31,886, and at Lancha Plana, \$18,000, as far as could be ascertained; but in all probability this is but a fraction of what was actually raised by this race. At Butte City a very rich discovery is reported in the Morgan & Co.'s mine. This mine is in a quartz ledge in the Red Hill claim, and it is said to be the richest rock ever taken out of any mine in this county.

The following named mines have rendered reports, viz: Bunker Hill, Empire Gold, Consolidated Amador, Gover, Keystone, Oneida, Lincoln, Original, Jupiter, Pacific, Gold, Wright Q, Centennial, Volcano Mill, Robinson, Original Amador, Washington, Wheeler Gravel, and Camutea Hill. Their total production, with \$49,886 gold produced by Chinese, amounted to, gold, \$1,495,053; silver, \$1,953; total, \$1,497,006.

BUTTE COUNTY

Is one of the earliest mining counties in the State. Quartz mining having been pursued with comparatively poor results, hydraulic mining is the chief industry, and an immense amount of gold has been found in the dead river bed constantly discovered in various parts of the county. The sources of the water supply are chiefly from the various branches of the Feather River, Butte Creek, Dry Creek, and the watershed of Table Mountain.

Twelve miles north of Oroville, near Cherokee, is the Spring Valley Hydraulic Gold Mining Company, the principal producer and one of the largest enterprises of the kind in the State. This company comprises two mining properties, viz, the former Spring Valley Mining and Irrigating Company's mine and the Cherokee Flat Blue Gravel mine, representing over 1,200 acres of mining ground, of which one-half is fit for hydraulic operations and the remainder for drifting. The new company entered into possession on March 16, 1879, works throughout the year, employs over 100 men at an expense of over \$10,000 per month, and will produce not less than \$500,000 per year until further improvements are completed, when its production will be greatly increased. The production consists altogether of gold, ranging from 950 to 985 fine. Here and there a little platinum is found, also diamonds of very fine quality, but rarely, as they have to be picked out only during the cleanups of the flume.

The company has decided to extend the canal used to carry the *débris*

from the Cherokee mines through Hamilton and Gridley Townships, about four miles further southward towards the Buttes. Here are also located the Sinclair Flat Hydraulic and the Little Keneshaw, and there are still many good claims in the neighborhood awaiting development.

Oroville is the principal mining town in the county, many of the most important mines of the different branches of the Feather River being tributary to it.

Almost opposite the town, across the Feather River, are the claims of the Oroville Mining and Irrigating Company, one of the most valuable in the State. Mr. O. P. Powers, one of the principal owners and manager, has recently perfected and put in operation a new hydraulic pump, which has been so successful in its workings and created so much interest that we give the following as reported in the Oroville Mercury:

A few hundred yards below where Mr. Powers has worked for several years past, is a flat piece of ground that in summer is but little above the level of the river, and in winter, when the river is high, is entirely covered with water. The bluff near by is soon to be worked, which will cover the flat above referred to with tailings and other *débris*. But how to work the flat was the question. There was no fall, and of course no place to dump the tailings. He has been for the last month working in this way. He has made a flume and laid it on top of the ground, commencing at the river and running back, say 400 feet. The last piece of the flume is 48 feet long, and connected with the next box in such a way as will admit of its being raised or lowered, and stands at an angle of about 45°. A head of water of 100 inches, with 200 feet pressure, was being used. The nozzle of the pipe entered the head of the flume about 1 foot. The head of the box was otherwise closed tightly, and covered on top about 1 foot. The balance was open, the same as any other flume box. Where this piece of the incline flume connected with the next box was covered on the top to prevent water, gravel, and stones from going over, they would thump up against the top, fall down, and be carried off.

This is the whole process: Shovel the earth into this open flume, set up at an angle of 45°, turn on the water, and it will go up the flume like a shot out of a gun, bump up against the top after going through the first joint of the flume, fall into the second box to be carried off the same as in any other flume. While watching the four men employed shoveling the earth into the flume, Mr. Powers tumbled a 60 or 70 pound rock in, which was carried up the incline with ease into the flume beyond. They have been at work only one month, and burrowed a large hole in the earth, into which Mr. Powers has placed a chief and turned on the water, loosening the gravel by the carload, which flows into this slanting flume and is driven up into the level box. As they are near the river, and below its surface, from 75 to 100 inches of seepage water is constantly coming into the works, but does no damage; it soon runs into the slanting box, and it, too, is driven up the 48 feet of incline into the almost level flume beyond.

We desire to state here that this slanting flume box, 48 feet long, is lined on the bottom and sides, inside, with wooden blocks, the same as those usually found at the bottom of flumes, so that the space inside of this flume was 1 foot wide by something over 2 feet in depth. It is a simple contrivance for mining level ground, where a head of water for driving purposes can be obtained. Any man who ever made a flume box can make one, and that, too, at a cost of less than \$100, including the blocks to line it. It is one of the simplest things on earth, and ought to have been found out years ago. It has been in operation over a month, and been examined by mine owners in this and adjoining counties who pronounce it a complete success. No part of it wears out faster than the ordinary flume, except at the upper end where the rock and gravel bump against the covering, which wears out very fast. Should timber be used for covering instead of boards, it would last a longer time.

The Oroville and the Feather River and Ophir Water Company rank next to this company in production.

The Wyandotte Hydraulic Gold Mining Company report but a small yield, for the reason that the company could obtain water only during certain seasons of the year. In this mine they are successfully working the Cranston elevator. A much larger yield is promised for the next report.

The Banner mine has completed very substantial hoisting works and is again in operation. This mine has a fissure lode, greenstone foot wall,

black slate hanging wall; the course is nearly north and south, dip east. Its ore is of a high grade and its bullion worth \$19 per ounce. This mine has had a very productive past, and its future prospects seem well assured. The old ledge has been reopened, and the larger returns which have been looked for are having confirmation in a rich strike in 223 feet level.

The Minerva quartz mine, which also comprises the Amoskeag and the Clarke and Coffee, adjoining the Banner mine, has three miles of water ditches, and, with quartz averaging \$49 per ton, will soon make a most excellent showing as a producer.

The Frost and Rule Canal Mining Company is located on the east bank of the Feather River, about six miles below Oroville. They have recently built about ten miles of ditch and flume, which is considered one of the finest pieces of work of that kind in the State. The flume is 6 feet wide by 3 feet deep, and will carry over 3,000 inches of water. This mine is considered to be one of the best in the State, having been sold some time ago to Boston capitalists for the sum of \$200,000, and today there is not a dollar's worth of stock to be had at any price. There is a face of gravel over 200 feet in height, ranging from one mile to a mile and a half in width, and running back over the ridges for over five miles—an almost inexhaustible supply of gold-bearing ground.

The Oro mine, east of Oroville, on the south fork of the Feather River, is driving a deep and long tunnel. They are now in 700 feet, and expect to tap the ledge in a few feet more at a depth of 625 feet from the surface of the ledge, and the general prospects are said to be very fine, as they will then be able to work by water power. Its ledge, which has been worked by steam power for a depth of 225 feet, has paid \$12 net per ton.

The Butte mine, which is in the same vicinity, is also running a tunnel. Its vein is a streak of decomposed quartz, assaying \$75 per ton.

The Miocene Gravel Mining Company is expending about \$200,000 in fitting up the claim and in bringing water to it. It has mammoth banks in Thompson Flat just north of Oroville. Many of the gentlemen interested are leading capitalists of the Eastern States, and everything is being done to make the enterprise a success.

The Morris Ravine mine is one of some promise for a new one. It is already a good producer, as evidenced by the returns. Its post-office address is Oroville.

About four miles below Oroville, on the west bank of the Feather River, Messrs. Gessner & Falconer have embarked in a mining enterprise on the Parks & Schaffer ranch. They have taken the 20-horse power engine and perambulating boarding-house of their thrashing outfit to the ground and begun operations. The scheme is to pipe down the bank with the water raised by two of Horr's patent rotary pumps—one throwing two hundred gallons per minute, the other fifty—and use the same water for a sluice-head. Should the supply prove insufficient for both purposes, they will put in another pump to give them the needed amount for the sluice-heads. The ground prospected from \$80 to \$120 to the pan. There is no question concerning the richness of that soil in precious metals.

Four citizens of Oroville have patented a claim for a strip four miles long and a quarter mile in width on the bed of the Feather River, just above the town. Their scheme is to sink shafts on the banks of the river and run a tunnel from the bottom of the shaft to the bed of the river where rich dirt will be found in abundance, as it is generally conceded that the portion of the bed of Feather River is the richest in gold

of any land in the county. There is much activity in the old mines in the vicinity of Oroville. In Oregon Gulch district there is only one hydraulic mine in operation which is paying well—that of Gregory & Welch. Quartz operations have been at a standstill for some years, but it is now again becoming lively in the way of prospecting. Near Oregon City is the Centreville mine, which is in process of development. A short distance above the town Messrs. Rhodes & Treadwell expect to put up a mill on their rich ledge now being developed. At Butte Creek parties who own valuable claims which cannot be worked by the Shepherd ditch have located a new ditch, commencing about 200 feet below the Cherokee head dam, running down the west side of Butte Creek and terminating at Centreville. Its capacity is 4,000 inches, and it is being built above all the mining ground along the creek, thus finding ready sale for all the water that their ditch will carry.

A very rich and extensive deposit of blue gravel has been struck by Woodson & Co., in a tunnel they are running at the forks of Butte Creek. At Yankee Hill, a company consisting of William H. Vanderbilt Governor Geo. C. Perkins, James C. Logan, Thomas A. Edson, James H. Banker, A. J. Drexel, E. W. McKinstry, G. W. Cumming, and others, have taken 11 miles of the North Fork of Feather River. They will run a tunnel in the Big Bend, which will drain the river for 11 miles and leave exposed its entire bed rich in deposits. J. D. Barry, a civil engineer sent up to view the ground for the proposed tunnel and report as to the feasibility of the plan, after spending a week traveling over the ground, says that it is a piece of engineering that can be easily accomplished, and he has heard no one place the amount of gold that may be taken out of the river bed as high as he has. This river has been a sluice-box for the mountains for centuries, and the wealth that has accumulated in the bottom is simply enormous.

The mine of Mr. C. Natt sends us the largest returns from Yankee Hill. The Chinese here have produced \$15,000 in gold.

There are no quartz mines working in the vicinity of Brush Creek; the chances, however, are reported as being good. What mining there is done is on a very small scale, but the total yield of these mines within a radius of 15 miles, it is safe to say, is at least \$100,000 per annum, although we have returns from only one mine, the Kentuck. From Bidwell's Bar, on the Middle Fork of Feather River, we have returns from the Blooming Ditch Gravel Mining Company, which is the leading mine here. Mining is mostly done by stragglers who work in the gulches during the rainy season.

At Big Indian Bar, on the same fork of the Feather, a company of Chinamen are engaged in mining on an extensive scale. They recently purchased a very rich claim from E. P. Farnham, and are engaged in erecting a flume 22 feet wide and 400 feet long. This ground has always paid well and is believed to be exceedingly rich. At Magalia are a number of excellent prospects under process of development, notably the Meredith, Sitby, Delaney Quartz, and Hood & Son. The Magalia Gold Mining Company is the only mine making us any considerable return from this place. This is considered one of the best mines in the county under proper management.

Work is going on vigorously in the Meredith, and within half a mile of this mine there are at least a dozen ledges of equal value.

The Red Hill claim, of which Mr. J. L. Chadwick is the superintendent, is a new mine, which bids fair to stand second to no hydraulic mine in the county, when water is brought in on a large scale, which is now being done.

The Old Channel Gravel Mining Company, near Magalia, has made no returns, but it is understood that it is again producing.

Messrs. Fulton & Co. have a mine here, in which there is a bank of gravel from 20 to 75 feet deep, bearing gold from the top down. The gold in a lower stratum is of a coarse order, ranging from ten cents to \$20 per nugget. This mine will soon become a noted one in the county. This firm also own a quartz ledge, or rather veins of quartz, in which are occasionally found pockets of gold, containing from \$50 to \$300 and one pocket was opened which yielded \$4,000 in two hours' labor.

The Limestone Channel Company is pressing its work forward with much vigor.

Parties have struck a fine lead of gold-bearing quartz due west of Nimeshaw, which is supposed to be an extension of the Meredith.

The Mammoth Tunnel Company has inaugurated one of the most important mining operations in Northern California, that is to test the Great Nimeshaw basin, which is known to be as rich as far as prospected; but it will take an outlay of considerable capital to sink their proposed shaft, which they have now commenced, to ascertain the depth of the basin, and the proper place at which to drain the same and take out the pay dirt. The Birch & Barret claim, the Cole claim, and many others, from which large amounts have been taken, are deposits on the outside of the rim of this basin, which, opened in the manner in which the Mammoth proposes, cannot fail to result profitably.

Two miles from the Meredith, near Lovelocks, Messrs. Sterns & Nealley are prospecting what appears to be a rich quartz ledge. At Forbestown the Union Consolidated mine has opened with good prospects, having 140 tons of ore on the dump, and a new Huntington mill just completed.

In the vicinity, in Forbes Gulch, the Sam Davis mine is working with fine prospects. The Vermillion Gold Mining Company is developing its claims by hydraulics, the water being obtained by the operation of a large and powerful pump.

A "big" strike is recently reported in this mine, which has sent a thrill of excitement throughout the neighborhood. At Clipper Mills the Bee Hive Gold Mining Company continues its production, with most encouraging prospects ahead.

The Empire Hill has lain idle for some years, but it is soon again to be reopened. In the neighborhood of Mountain House, mining interests are being extensively developed.

In the mining camps of Laporte district much activity prevails.

The Chinese at Chico are reported by the Bank of Chico to have produced \$2,000, making, with that reported at Yankee Hill, a total of \$17,000 in gold.

The following mines have rendered reports, viz: McConnell & Duret, Bloomer Ditch Gravel, San Clais Hydraulic, Spring Valley Manufacturing and Irrigating, Little Keneshaw, French Creek, Feather River and Ophir Water, Oroville Manufacturing and Irrigating, Oroville, Lott, Banner, Sinclair Flat Hydraulic, Spring Valley Hydraulic Gold, Morris Ravine, Big Bear Hydraulic, Gravel, Magalia, Kentuck, Sam Davis, Conover, Red Hill, Meredith, Bee Hive Gold, Mississippi Bar, King Bird, Dodson, C. Napp, and A. Peterson. The total amount produced by the mines named, with \$17,000 in gold produced by Chinese, was: gold, \$430,501; silver, \$1,247; total, \$431,748.

CALAVERAS COUNTY.

Its mining interests have been gradually improving for some years, and the prospect to-day is more encouraging than at any time within

the past ten years. During the past year many rich quartz veins have been discovered, and costly improvements have been made in many localities in the way of erecting the necessary buildings and machinery for operating the mines successfully. The quartz-mining interest, however, is not by any means the only one exhibiting renewed vitality. Hydraulic mining is reviving, and the approaching winter promises encouraging results. The principal field of operations in hydraulic mining is confined within narrow limits; it is mainly along Chile Gulch, extending only a few miles from Mokelumne Hill, in a southerly direction. What are known as Chile Hill, Stockton Hill, Red Hill, all in near proximity to each other, embrace the principal hydraulic mines, although there are several in other sections of that country that are likely to prove bonanzas to their owners. There are large interests in the central and southern portions of the county, where considerable amounts of gold will doubtless be obtained during the winter months, when the supply of water is abundant. In the neighborhoods of Calaveritas, Fourth Crossing, San Antone, Dogtown, Angel's, Albany Flat, Vallecitos, Douglass and Murphy's, placer mining is still pursued with profit to industrious men, but in the course of a few years quartz mining will in all probability transcend all other industrial pursuits in Calaveras.

At Mokelumne Hill the discovery of quartz of unparalleled richness in this vicinity has added fresh fuel to the mining excitement which has not been equaled since the early days of flush times. Rich developments are being made on every side, and new discovery appears to surpass all its predecessors in richness. It is claimed that this is the best quartz-mining region in the State.

The principal mines at this place, named in their order of production, are the Eureka, Bonanza, Mammoth Hydraulic, and the Moser, the former being the most noted mine in the county. Its condition is described as follows:

At present there are forty men employed in the Eureka, operations being pushed without interruption day and night. Two giants, spouting a thousand inches of water, under a pressure varying from 250 to 300 feet, are thundering away at a bank of auriferous gravel averaging about 40 feet in depth. Acres upon acres of ground have been washed away, and yet the claim may be said to be only just fairly opened. Practically speaking, there is no limit to the bed of gravel. Water is supplied by two ditches belonging to the mine. One, five miles in length, takes water from the Calaveras, while the other extends to Rich Gulch, and is supplied from Clark's great canal, via Railroad Flat. From the ditches to the mine the water is conducted in huge iron pipes, solidly riveted together, varying from 11 to 15 inches in diameter.

The water privileges connected with the Eureka are invaluable and have much to do with constituting it one of the most promising gravel mining enterprises in the country. The water rights embrace both the Calaveras and Esperanza rivers, sources capable of supplying a thousand inches of free water the year around. When it is recollected that the cost of 1,000 inches of water, if it had to be purchased, would amount to something like \$125 per day, some idea of the advantage conferred by free water in a hydraulic claim can be obtained.

It is in contemplation to finish the Esperanza ditch to that stream and then continue the canal along down the ridge below the Eureka, ultimately throwing the water on to the rich placers of Pine Peak. All along the line of the ditch—which will traverse one continuous gravel bed from first to last—hydraulics can be established with the advantage of free water, cannot fail to be remunerative.

The Bonanza on the same ridge is another excellent property. It has all the modern mining appliances with which to facilitate operations, and the claim is sustaining its excellent reputation. A new flume is at present being laid, in order to wash off some gravel on the edge of the claim. An immense amount of work has been done in this mine during the year.

In the Duryea the picking and carting the bottom gravel is completed and preparations for hydraulicizing have been made.

The Gleeson mine has completed its hoisting works and the laying of pipes, and is now in full blast. The water is conducted through pipes and has a pressure of 240 feet, which, when directed against a hurdy-gurdy wheel, will do the work like a charm.

The La Belle France has had a general overhauling and cleaning up of its mine, and it is now being worked by a full force of men.

The Penobscot, adjoining the Mammoth, has resumed operations and is working on a more extensive scale than ever; 500 feet of the 30-inch flume has been laid and paved, through which the gravel is to be carried by 500 inches of water. A bed rock tunnel will also be run, in which an extension of the flume will be laid as soon as the vein gravel is removed.

The Whisky Slide mine has struck a very rich lead in the tunnel, which increases in width as work progresses. A remarkable feature of the ore is the peculiar forms in which the precious metal was arranged. The gold seemed to be in geometrical figures, octohedra and cubes predominating, forming very beautiful natural specimens. This mine promises to prove a most remunerative piece of property.

The Hoosier mine, a late discovery, is looking remarkably well. All that it needs, to make it an immediate producer, is a battery to crush its ore, and we learn that it is the intention of its owners to see that it is supplied with the necessary stamps.

The Boston mine, now known as the Knox and Osborn, is being operated with most flattering success. It has an enormously large lode, which is exceedingly rich, and it bids fair to become the leading producer in the State.

It is situated in Buckeye gulch, about $2\frac{1}{2}$ miles from Mokelumne Hill. It is worked from two tunnels known as the east and west tunnels, respectively; they both commence from the bed of Buckeye Gulch, and follow the vein with the mountain. The east tunnel is now in 100 feet, following the east wall. The face of this tunnel is in low-grade ore which will mill from \$3 to \$5 per ton in gold. The west tunnel follows the foot wall, is in 220 feet, and has passed through fair grade milling ore from the start, that is, ore that is thought to contain from \$6 to \$10 per ton in free gold, and the concentrations from \$2.50 to \$3 more. A crosscut from the west tunnel to the hanging wall has been run, showing the ledge to be 60 feet wide from wall to wall, and it is safe to say that the entire body of quartz between the walls will pay by milling process from \$6 to \$8 per ton, possibly not over \$4. Two-thirds of the gold is free, and consequently can be saved on copper plates. The crosscut is run from a point 110 feet from the mouth of the tunnel, where also an air shaft has been raised to the surface on the footwall 125 feet, and pay quartz found clear to the grass roots. At the top of this air chute or shaft the third tunnel or adit level has been started on the course of the vein, and is also in a corresponding grade of quartz to that of the west footwall tunnel. This third or upper tunnel is in about 25 feet. The first two tunnels have car-tracks in them. The east tunnel being some 25 feet lower than the west tunnel, it is an easy matter to keep the mine well ventilated by a series of crosscuts.

In addition to the mine developments, the Knox & Osborn Mining Company have completed a 20-stamp water-power quartz mill, which is situated some 70 feet below the level of the mouth of the tunnels, and is connected with them by a car-track. The facilities are first-class for cheap and economical handling of the quartz. It is hoped by the owners that when greater depth shall have been attained a better quality of ore will be met with, but even with the present grade of quartz the mine can be made to pay all running expenses beyond a doubt. There is now on the dump and ready for the mill some 2,000 tons of quartz, and from 40 to 50 tons per day can be broken to keep the mill busy when it is ready to run, which will be in two or three weeks from the present writing.

The mill, with the rock-breaker and the Frue and Blatchly concentrators, is run by a Miners' Foundry water-wheel, requiring only 45 inches of water. The mill has a capacity of 40 tons per day, and the rock-breaker can crush 80 tons in ten hours. Four Frue machines take care of the sulphurets from 10 stamps, while the Blatchly machine, consisting of 8 tables, easily takes care of the sulphurets from the other 10 stamps, and it is thought can do the work for 20 stamps. The mill is a good one and

is doing very satisfactory work. From 12 to 15 men have been constantly at work in the mine since our last report, keeping the mill supplied with quartz. It requires two car men to deliver the quartz at the mill—two in the day and two at night—five men, one man on the crusher, tend the mill day and night. The mine everywhere looks well, especially in the face of the west tunnel, which is the most advanced of any work in the mine. Several important outside improvements to this splendid property have been made since our last account, chief of which is a wagon road from the mill to the head of Alexandria Gulch, where the company has been getting out soapstone with which to erect a chlorodizing furnace. Lastly, a charcoal retort, with a capacity of 400 barrels, the first charge of some 350 barrels having just been burned. This is the second retort of the kind ever put up in California, the first having been put up some years since by Mr. Osborn, in Napa County. The charcoal from these ovens or retorts is much superior to that procured from mound pits.

The Stein mine is running a 60-stamp mill, and also a smelter, with satisfactory results to its owners.

The Happy Valley Blue Gravel mine has been closed down for some time. It is on the same channel as the Bonanza, Mammoth, and Penobscot, at the head of the old river channel, and contains 100 acres of good mining ground. It has a tunnel 2,200 feet long, which taps the channel. It is claimed that this mine is capable of producing \$1,000 per day, but owing to bad management and discord it is doing nothing.

There is much excitement in the mining market in Happy Valley district. Among the late discoveries having much promise are the Mokelumne Hill, Fortuna, Shall See, Bandin, and the Admission. The Fortuna is located between French Hill and Dutchman Gulches, on the Mokelumne River. It shows an immense lode bearing rich sulphurets and free gold, and it is rapidly developing into a fine mining property. A force of men are kept at work on the Bandin, and progress is being made, with encouraging prospects. This mine has recently been sold to San Francisco parties for \$30,000.

Work on the Chicago is being continued, with favorable prospects for good developments.

The North American ledge, a late quartz discovery, is opposite the old Foot and Thompson mine, about six miles from Mokelumne Hill. The ore is richly studded with gold, and is of a good character.

The principal tunnel claims in active operation are the Green Mountain, La Belle France, Rough Diamond, and Safe Deposit, all within a radius of three miles from Mokelumne Hill.

We have no report from the Gwin mine, nor has it been ascertained whether it is producing.

We hear of a new discovery, Toda & Moore, which is supposed to be upon the southern extension of the Gwin mine, one mile distant. A Chinese company reports its production as \$4,573.

At Angel's Camp, and in the immediate vicinity, considerable quartz mining is now going on, and the mines have not looked more favorable for the past ten years.

We have returns from the Monarch, the Bully Bully, and the Confidence mines. The two former being among the Dogtown mines, two miles below Angel's Camp. The Monarch is the old Garibaldi, which was sold to the present owner for \$40,000. They are drifting at a depth of 140 feet. The mine pays \$6 a car load. The Bully Bully, on the same lead, is also a rich mine of the same character.

There is much cement in this gravel, and it cannot be washed until it is prepared—which is being done by hoisting to the surface and spreading out until it dries; water is then sprinkled over it, when it is left for two months, after which it can be washed in the ordinary way.

The Keefer Hydraulic claim, on the same channel, have a ditch and a new flume to carry 3,000 inches of water, and are expending a large sum

to thoroughly open their claim. They have a bank 100 feet high and the width of the channel, to wash out. The mine is expected to be a very profitable one when fully under way.

The Deep Blue Gravel mine is turning water into its ditches and everything is now in active operation.

The Excelsior is a new discovery, which prospects encouragingly. Its lead is 3 feet in width, a large proportion of which is sulphurets of a good quality.

The vein in the Fletcher mine is increasing in width as the shaft goes down, and is much richer than at first.

The McElroy, on Bald Hill, is operating upon gravel which yields 12½ cents per pan.

Messrs. Fisher and Osborn have purchased the mine known as the Raspberry, situate on Smith's Flat, 10 miles from Angel's Camp, and will at once commence sinking a shaft. This mine was very rich in early days.

At Murphy's the Shawamut Gold Quartz Mining Company has made some milling tests of its ores, but finding them too rebellious for treatment by their present facilities, are now putting in concentrating machinery preparatory to the resuming of work in the mine. There is here a 10-stamp mill and Willard furnace for roasting auriferous ores for chlorinations, the process being as follows:

The ore is crushed dry, then elevated in a screw conveyor and mixer, mixed with sawdust, dampened and carried to a bin above the furnaces. The bottom of the furnace is a perforated iron plate, and but little fuel is used underneath. The heat is slow combustion and heat by means of the sawdust among the particles of ore. An air-blast underneath the perforated bottom of the furnace forces air through the interstices left in the place of the consumed sawdust, oxidizing the metals and preparing them more perfectly for chlorination than by any other process yet devised. Sulphur, arsenic, antimony, and some zinc, are driven off by the air-blast. The roast is a dead one, and entirely free from sulphate of iron. In working silver ore, where a chlorination is wanted, 2 per cent. to 5 per cent. of salt is added. From three to six hours are occupied in roasting, according to ore. After the ore is roasted it is thrown out on the cooling floor and passed through Cornish rolls and then passed into the chlorination building on the upper floor. The floor occupies one-half the width of the building. On this floor stand ten tanks of two and a half tons capacity, each with false movable bottoms. In these the finely pulverized ore is placed, dampened and chlorine gas introduced underneath by pipes, dissolving the gold and silver. The ore is then covered with water, and the precious metals leached off into ten tanks on the floor beneath, where it is precipitated in the form of a black, salvy mass, three-fourths gold in bulk.

The new discoveries are the Sonora, Bristow, Sunny Side, Al Henry, and many others of lesser merit, in the immediate vicinity.

At Robinson's Ferry the Adalaide mine is a new discovery, and makes its returns for a portion of the fiscal year. Its ore is rebellious, carrying lead, antimony, copper and tellurium. On the east side of the vein is slate and decomposed quartz carrying free gold.

A new mine, that of Rapp & Hillman, is being developed with flattering results in free gold outside of vein. Its vein is 2 feet wide and yields on an average \$15 per ton. There is a chute that assays very rich. Every indication seems to point to large deposits under the center of the hill, towards which the tunnel is gradually approaching.

A number of new locations have been made, but none of them are sufficiently prospected to know of their value.

At Vallecito and Douglas Flat the mines are principally gravel; lack of capital has prevented their being worked to any extent. There are miles of ancient river channel from 130 to 200 feet deep, that have never been opened, but the gravel of which is supposed to be enormously rich. Wherever the channels have been opened they have paid well, and it is supposed to be one of the best fields for capital in California.

The season here was very good until the 1st of October, when the water was cut off to repair the ditch of the Union Ditch Company. The water comes from the North Fork of the Stanislaus River, and the company supplies nearly the whole southern part of the county.

Messrs. Sloan & Birch own a quartz mine near Vallecito, which has been thoroughly prospected and has proved to be a valuable mine.

The Moffat & Barnes drift claim at Vallecito is paying well. The mines in the vicinity are all worked by drifting.

In the deep channels the miners have generally to slack the gravel—where the gravel is cement—but in these claims a wash up can be made at any time.

Near Glencoe is the Norwich mine, which was formerly known as the Greve and Gamble. More recently it was relocated under the name of The Nucleus, and finally it was incorporated under the name of the Norwich Gold and Silver Mining Company. The mine has been worked in a rude manner to a depth of 117 feet, and all the work performed is on one ore shute which will not extend over 100 feet either way. The vein is from 8 to 25 feet in width, and carries a very large percentage of sulphurets which assay over \$300 in gold and \$50 in silver. Up to this time these have not been saved. The present company, however, will have every appliance known to the modern system of milling attached to the mill for saving these valuable sulphurets. The present working shaft is 60 feet deep, and is being retimbered. Machinery, with a capacity for sinking to a depth of 1,000 feet, is being put on to accomplish it. It is the intention of this company to sink the shaft to the 150-foot level, before running cross-cuts and drifts.

At Mosquito, a very promising quartz ledge is reported as recently discovered. The ledge is wide, rich, and has every appearance of being a true vein.

The owners of the Excelsior mine are engaged in hauling rock to Garland's mill, at Mosquito. They have over 60 tons of as fine ore as was ever put under stamps.

The proprietors of the Glencoe Consolidated, near Mosquito, are busily engaged in taking out rich rock.

At Telegraph City the Eagle Copper and Silver mine is shut down, owing to litigation. This mine has taken out in a single year over 2,000 tons of ore, averaging \$100 per ton in copper, gold, and silver.

At West Point is the Champion, the second mine in order of production in the county. They are now stoping and sinking winzes on rich rock, the vein still growing larger, it being now 5 feet wide at a depth of 600 feet. Its mill is kept running night and day.

Messrs. Ochra & Co. report excellent prospects for their mine, the Riverside, which is productive.

Mr. John Gouldson writes that—

There are no regular producing mines, with the exception of the Champion, in the vicinity of West Point; the mining being done by our own citizens, on a small scale, and is the result mostly of quartz mining. West Point mines run north and south; the formation is granite, the ground being soft to the depth of 100 feet or more before striking hard ground or water. It gives the laboring man a chance to *rise* in the world; but as soon as he strikes hard ground or water he quits, travels away, and leaves no one the wiser as to what he took out. I can mention over a hundred mines—or of such efforts, in this vicinity. Capital is required to make further developments. We have some fine quartz ledges, which, if capital was used in them, would bring an annual product of over \$1,000,000 in gold alone. The ledges average from 8 to 25 feet wide, and they can be traced on the surface for over a mile, which, if properly developed by energy and means, would increase the production of the State for an astonishing sum for the next forty years. I estimate the production of West Point mining district for the fiscal year \$200,000 in gold.

The Tidal Wave mine has been recently sold to parties who intend to develop it shortly. Work has been recommenced on the Lone Star mine.

Sheep Ranch. The Sheep Ranch Mining Company, owned by Messrs. Haggin & Tevis, of San Francisco, is the leading mine here, and reports a production largely in excess of any other mine in this vicinity.

The Amelia is located on the same lode as the Sheep Ranch, and is considered a very encouraging prospect. Its shafts have to be sunk deeper and the drift tunnels run a long distance to ascertain the true value of the property. Its production has been quite satisfactory to the owners.

The quartz mine of Messrs. Smith & Goldworthy, about a mile below town, is showing fine quartz. Mr. Harvey Childers is reported to have struck a rich vein on the San Antonio mine. At Milton the New York & Calaveras Gold Mining Company make returns of their production. At Jenny Lind, the New York Placer Gold mine is also a productive one. From a place called North Branch, the German mine sends report of a small production. At San Andreas is the Table Mountain and San Andreas Water and Mining Company, which is the only mine reporting production here.

It is estimated that the Chinese produced at this place \$40,750, and at Campo Seco \$2,220—or a total Chinese production for the county of \$42,970.

The mines reported from this county were: Sheep Ranch, Red Wheel, New York Placer Gold, Monarch Gravel, Moses, New York and Calaveras Gold, Mammoth Hydraulic, Penobscot Hydraulic, Bonanza Hydraulic, Eureka and Concentrated, Chay Kee Hydraulic, Buckeye, Brown & McSorley, Champion, Rodesino, Table Mountain and San Andreas Water, Adalaide, German, Confidence, Bully Bully Quartz, Amelia Gold, Brank & Saunders, Riverside, Tom Paine, Shawamut Gold Quartz, Hillman Chapin & Co., McElroy Gravel, and Watsons. The total production of the mines named was, with \$42,970 gold produced by the Chinese, gold, \$320,865; silver, \$643; total, \$321,508.

EL DORADO COUNTY,

Where the first gold was found in California, has yielded very largely in the past, but for the last ten years there has been less successful mining done. Recently, however, new interest is manifested in El Dorado mines, which are attracting operators from all parts of the country who are investing in the ledges and gravel beds, which are supposed to be much more valuable than they have been heretofore considered.

Although our returns are only for \$389,591, this amount was produced by the comparatively large number of forty-six mines, and of which sum the Chinese are credited with having produced \$118,060. It will be seen, therefore, that the production is very much divided. Only seven mines report more than \$10,000. There seems to be a generally diffused hopefulness, and as many of the mines are new ones, the expectation of a much larger yield is very reasonably indulged. The largest number of mines reporting production are situated in the vicinity of Placerville, and of these the largest yield is reported by the Lyon Gravel Gold, Robinson, and the Blakely Hydraulic.

The 10-stamp battery to be added to the Lyon Mine mill will soon be ready to work. Meantime, the developments in the mine are daily becoming more encouraging. The old Dictarhoff, owned by the same company, is proving much better than was hoped for. These mines, several

miles apart, and both on the great channel between Corn Hollow and White Rock, are demonstrating the large wealth which lies buried in that two-mile line.

Near here the Grand Victory mine has just started a new mill, and every arrangement has been made to run the mine on an economical basis, and the ore in sight indicates a good margin of profit for the capital invested.

The Placerville Gold Quartz mine has recently struck a new ore body which proves to be wonderfully rich. It is of a peculiar formation, interspersed with slate in such a manner that the whole is worked as taken from the ledge, which is 5 feet thick and exceedingly rich all through, and there can be no doubt that it extends to the surface, and downward how far is not known, but the supposition is that this and the main ledge come together before 1,000 feet is reached, and a solid mass of \$40 rock will be the result. This mine, formerly the Pacific, is under the general management of Prof. Thos. Price, who is acting in behalf of the owners, who are London capitalists. Everything is being thoroughly and systematically worked, and the arrangements for mining and milling the ore are complete and substantial. These works give constant employment to upwards of fifty men.

We have advices that the following mines have been opened this season: The Chaparral, Ringold, and Gross. The Chaparral, which lies north of the South Fork of the American River, and near Chili Bar Bridge, has been purchased by Mr. Bernard Lands for \$45,000. It has a new mill, and everything pertaining to it is in first-class order.

On the Ringold improvements are constantly making, and prospecting is going on with encouragement, as a large body of good ore has been taken out, which is being taken to the Reed Mill, which has been leased by this company.

The Reed mine is now clearing out its tunnel and preparing for active operations. Rich rock has been struck in the Gross mine, and a drift is being run to ascertain the extent of the deposit.

In Big Cañon the Gergenson process is to be tested on a large scale. It is known as the steam oxidized and amalgamating plan. Works have been erected, consisting of furnace and Pacific grinders, by which 12 tons of ore per day can be worked, and it is claimed to be able to extract 90 per cent.

The bed-rock flume near Placerville is making steady progress, and it is a most substantial affair. The sleepers are fastened to the bed-rock by bolts shaped somewhat like an old-fashioned clothes-pin inserted in drill holes and fastened there by a composition.

The works of the Placerville Gravel mine are now all in working order. All of the regularly operated mines are looking as well as ever, and some much better, and the yield for the season promises to be much larger than for many years.

At El Dorado the Springfield is the only mine producing anything worthy of mention. It is the largest yielder in the county, and the recent developments give promise of a largely increased production. In driving a cross-cut a new chute of ore was discovered which is rich and continuous, and it now appears clear that its ledges at great depths are as strong and rich as at the surface, and that in no portion of the State, on the line of the mother lode, is the quartz richer than in this mine and in its vicinity.

The Ophir has not produced anything this season, and the Starlight has only been worked sufficiently to hold the claim.

Work is going on in the old mines with various success, and the new ones are producing moderately.

Just west of El Dorado, at Shingle Springs, a new quartz ledge has been located which is reported as of much promise.

At Diamond Springs a great number of new ledges are being prospected with encouraging success. The Hart & Griffith, although a new mine, is one of the first in order of production in the county. The Griffith Consolidated, the Monitor, Grand Victory, and Central are all producing. The Chinese here have produced \$8,000 in gold. The mines in the vicinity of Nashville are reported to be very flourishing. The Cumberland Gold Mining Company proves to be a very valuable one, and its development has inspired the opening of many other good prospects. The Inez has made us a report of its yield.

At Newton is the Newton mine, one of the largest ten mines of the county. Near here is the Snow and the Iowaville Hydraulic, from both of which we have returns. A recent clean up of the Iowaville gives assurance to the opinion that there is still much good gravel in the neighborhood of Newton.

At Greenwood everything is progressing finely in the new mill of the California Water and Mining Company. The mill is a four-battery Huntington with ten Herder concentrator amalgamators, and, in short, has all the most approved appliances for saving gold, and is one of the most complete mills in the county.

The old system of hydraulic seam mines was a failure, for the simple reason that nine-tenths of the gold was carried away with the tailings. To pay, the vein matter of the seams must be crushed. The rock from a quartz mine might as well be expected to pay by running it through a string of sluices as the material from a seam mine.

The Nagle mine is hydraulicised to a depth of from 40 to 70 feet, and averaging 500 feet in width. Several millions of dollars have been taken out of this mine by former owners. The rock is serpentine, a talcose slate, generally decomposed. A shaft of 150 feet has been sunk, and the lode widens as the shaft descends. Two hundred thousand tons of rock lie on the dump ready for crushing as soon as the 30-stamp mill can be put in operation.

The Georgetown Divide Reduction Company is putting up an establishment here for reducing sulphurets, assaying, and working of gold-bearing ores in general.

The Dutch mine is producing gold in paying quantities. The Bower, which formerly yielded largely, is now being prospected with an encouraging outlook.

The Walker & Co. Quartz mine, in making a report of its yield, says, "It is worked by drifting through a regular continuation of seams, with most encouraging prospects of a further increase in our gold yield very soon."

Mr. W. J. McCullough is opening the North Star, and is fitting up the Dolly Varden and the Greenwood mine, both of which are paying.

The Rocky Point Gold Mining Company, the Gold Bar, the Sardine, and the Hoosier Bar are being developed.

The miners of Greenwood have been holding meetings to resist the application of the Central Pacific Railroad for the possession of certain lands in that region.

From Coloma we learn that a big ditch is now being made that will take the water from the South Fork of the American River at a point 38 miles above Placerville. The ditch is 16 feet wide at the bottom and 4 feet in depth. It will bring water for mining and irrigating purposes

sufficient to supply a large scope of country. The mining industry is reviving, and fine quartz mines are being opened here, at Greenwood Valley, Georgetown, and other places in that range. Much prospecting is being done, and a number of valuable discoveries have been made.

The Last Chance mine lies idle for want of sufficient capital with which to properly develop it.

Two miles from Coloma and five miles from Placerville is the Kimball mine, which has become somewhat noted in local circles. The mines in this vicinity are of the pocket order, and a number of rich strikes have been made in various localities. The Kimball is plethoric in rich pockets, which, report says, have yielded from \$2,000 to \$8,000, and in addition to these pockets the whole ledge averages from \$15 to \$30 per ton. The ore is of a peculiar character, resembling granite more than it does quartz, but fine quartz stringers are woven all through it. Its 10-stamp mill is in a fine location, and is run by water supplied by the El Dorado Water & Deep Gravel Mining Company, which company supplies that whole section of country with water for mining and irrigating purposes. A tramway is being erected from the mine to the mill. The ore from this mine is exceedingly rich, and the peculiarity of the quartz renders the inspection especially interesting.

At Georgetown the mining outlook is better than for a number of years past. In fact the whole divide might be said to have been unprospected until quite recently, when attention was called to its varied prospects. The great drawback, however, is the insecurity of title to lands, part of which are claimed by the railroad company for agricultural purposes. It is making an effort to secure possession of the odd sections under this plea, which is meeting with strong opposition. Until this question is settled capital will not seek investment in this locality.

East of Georgetown, in the direction of Slate Mountain, there is a large area of what may be termed virgin mining ground. There are hundreds of rich gulches which have never been worked, owing to the scarcity of water. Should water in available quantities ever be brought into that section there will be an astonishing increase in the bullion production of this county. Besides these gulches the country is checkered with promising quartz veins which have never been prospected.

The chief producing mine at this place is the Beattie Quartz. Wall Street mine is situated near Georgetown, on the noted Spanish Dry Diggings belt. In it there is a complete net-work of seams, all of which prospect rich, varying from 4 inches to 4 feet in width, and are heavily charged with sulphurets, which assay \$300 per ton.

On the same belt, Mr. Lewis Sites has opened exceedingly rich prospects. From a decomposed porphyritic rock he is panning out all the way from 75 cents to \$75 the pan. It is called the Modoc mine, and from present appearance it seems to be exhaustless. It adjoins the well known Pennsylvania mine on the east.

It is reported that work will soon begin on the Alpine mine, three miles southwest of Georgetown.

The Otter Creek Hill mine is opening up finely. At Grizzly Flat a new discovery is exciting much interest. It is a rich ledge, lying east of the Mount Pleasant and Eagle, which has been traced several miles. This mammoth ledge, at first supposed to be of silver, proves to carry a preponderance of gold. The assays run from \$26 to \$36 per ton, 80 per cent. gold. It is claimed that the ledge is more than 100 feet wide in places.

The wonderful richness of the Mount Pleasant has already stimulated

quartz mining in that district, and this new discovery will make Grizzly Flat the liveliest camp in the county.

Four miles from Latrobe, in the southwestern corner of the county, is the Faber mine, now creating interest by the great richness of its quartz, which occurs in a slate formation. The claim comprises two parallel veins 20 feet apart, varying in size from 6 inches to 2 feet, both opened by inclined shafts, the deepest of which is 80 feet. In the deep incline, at a point 50 feet from the surface, occurs the nest or chimney from which the rich quartz is taken. The gold is of 935 fineness, as has been determined at the mint. The locality of the Faber is celebrated for the occurrence of rich gold-bearing quartz.

The Chinese at Latrobe have produced in gold \$10,600. In Kelly district the outlook is more than encouraging. Improvements are being made in the Old Judge mine, and the Lady Emma has recently been reopened.

Near the Placer County line, and a little above Mammoth Bar, in Hoosier Bar, a San Francisco company are making improvements preparatory to sinking a shaft to undermine the river.

The following is a list of the mines rendering reports: El Dorado Water and Deep Gravel, Parson, Mameluke, Murphy, Golden State, Blieftrien & Co., Bryant mine, Connell, Kimball, Old Frick, Snow, Last Chance, Maynard & Duncan, J. T. Silvester, Park Canal and Mining, Oak Ranch Deep Gravel, Toombs, Ward, Loomis, Robinson, Hoskins, Green Mountain Tunnel, Anderson, Blakely's Hydraulic, Colo Gravel, Dickerhoff & Goyan, Inez Gola, Griffith Consolidated, Hart & Griffith, Newton, Starlight, Lyon Gravel Gold, Connell, Walker & Co., Iowa-ville, Johnson, Friedman, Reed & Coffin, Otter Creek Hill, Hansen Mill, Beattie Quartz, Pelton, Burgess, Springfield, Piepie Hill, P. P. These mines produced (with \$118,060 gold produced by Chinese): Gold, \$389,383; silver, \$208; total, \$389,591.

INYO COUNTY

Is rich in minerals, and for a number of years has produced quantities of silver and lead. Argentiferous galena and gold abound in its mountain ranges, and recent operations promise a full development of its resources of hidden treasure.

The great drawback to successful operations is the high rate of transportation charged on bullion going out and on supplies going in. With the extension of the railroad from Candelaria through Owens Valley, one of the best mining countries on the coast will be opened.

The prospects of mining industry are now very encouraging, as several companies have been organized in New York which are operating in the districts of Cerro Gordo, Swansea, Deep Spring, and Independence. The chief bullion production has been in silver, and near Darwin, are the New Coso and the Panamint, the richest silver mines in the county. The former has three smelting furnaces, which are extracting 10 tons of ore per day, which assays 200 ounces in silver and 5 ounces in gold.

The Maggie is also producing silver in paying quantities, with excellent prospects for an immediate increase. The Essex is a well defined lode, cropping out for over a mile or more. The shaft, now over 40 feet deep, shows a good grade of ore. In the Essex No. 2 a tunnel is driving to cut the lode. It is intended to cut the Essex and Essex No. 2 and the Kerso, and will have to drive 500 feet from west to east. The ores are carbonate and galena. The Branch Mint mine is not now running, as it is too expensive to raise the ores, owing to the nature of the incline.

Messrs. Gorman and Eddy have leased the old Defiance Company's furnace, and their enterprise has given a new impetus to mining interests here. Mr. Robert Steen has purchased the Mariposa for Mr. J. B. Haggin, and intends to build a 5-stamp mill on the premises. Work is being pushed with great vigor on the Mollie and Custer mines. There are some fine gold-bearing ledges in this district awaiting the advent of enterprise and capital. Miners are daily coming into camp, and considerable excitement prevails. A new mine, the American Union, is announced as having encouraging prospects.

The districts in the Inyo Mountains east of Independence are attracting much attention. The chief of these, Beveridge district, lies in the eastern slope of the Inyo Mountains, 25 miles from Independence. The almost inaccessible mountain faces of these deep cañons are seamed everywhere with exceedingly rich veins of free gold. They are proven by arastras to be of unusual richness, with every indication of permanence. Here the Freeborn Cañon Mill and Mining Company have some ten mines near their mill, which are well located, with wood and water in great abundance. They have made two short runs with a steam arastra with good results, and are now completing a 5-stamp mill, which, containing the best machinery and appliances in use, is expected to do a good business from the start.

In Hahn's Cañon, in this district, is Jaurez Camp. Dr. P. G. Gelcich has made every effort to secure an accurate statement of the production of the mines, which are owned and operated mostly by Mexicans, who are illiterate, ignorant of the English language, and careless in their accounts. Dr. Gelcich sends the gross production of eleven new mines, discovered since the fall of 1879. He says: "I did my best to obtain the most accurate statements of results from the work, which was only of a prospective nature, using the slow, primitive, and very expensive arastras to gather the gold, of which they lose a large percentage. These mines are very promising, and with the advent of capital and energy will create a sensation in these mountains." These mines are the Hidalgo, El Plano, Parrenir, Buena Vista, Rosaria, Virginia, Jaurez, Los Angeles, Santiago, Guadalupe, and Santa Barbara. They have produced within the fiscal year \$30,500 in gold.

The districts Cerro Gordo and Swansea cover the southern slopes of the high peaks of the Inyo range. As was previously stated, the sale of mining property in these districts to eastern capitalists has given a new impetus to mining industry, and has set a large number of miners to prospecting.

The Buena Vista is now being explored. A surface cut has been made across the big croppings which shows a well defined ledge 50 feet in width, and the assay of the ore, which is a chloride, promises well for the future of the mine.

The Perseverance mine is not producing this year. Only a small quantity of ore has been taken out, but the prospects are said to be most encouraging. The Keeler mine, on Owens Lake, has built a new mill and is working the Enterprise at Cerro Gordo, at which place there is also a steam arastra.

From Independence the following new mines are reported: Eagle, Argonaut, and the Rescue.

In Deep Spring district, in the northeastern part of the county, the new mines, Indian Scout, Gurnley, and Whitman, have raised much excitement by their recent developments. A new mill is being built, for which there is an abundance of wood and water.

The Chrysopolis Gold and Silver Mining Company own a dozen mines here, with a 20 stamp free gold quartz mill in close proximity to the mines. This has been neglected for a number of years but is now undergoing repairs for immediate operations. Twenty miles from Bishop's Creek a new mine has been opened in the Inyo Mountains, named the Reed. It is in two fine ledges, about 4 feet wide, that will average \$50 per ton, with plenty of wood and water near at hand. Several other ledges look well on the surface, but are not yet sufficiently prospected to warrant definite statement of their value. The fine prospects in Mazourka Cañon are likely to be enhanced by a recent discovery made on Badger Flat near the head of the cañon. The ore occurs in boulders inclosed in a soft, decomposed material composed of argillaceous earth colored with iron. This ore has been found in several places; it is rich in carbonate of lead, carrying much free gold, and the assays are very high.

Recent advices look toward the erection of a smelting furnace, with wood and water in plentiful supply. The site of the proposed mill is only two hours' ride from Independence, and the mines are easily accessible by good roads.

The New Coso mine is the largest yielder in the county, and next in order the Modoc, Panamint, and Custer.

The following interesting extract relating to the mines of this county, is from the Inyo Independent:

Beginning at Cerro Gordo and following the Inyo range north to Deep Spring Valley, a distance of about 60 miles, there is probably no region in the United States that can show as many and as rich mines and prospects as this section of Inyo County. The formation of Inyo range is mainly lime, slate, and syenite, in which is found high-grade ores of both gold and silver. Nearly all silver ores carry gold, varying in quantity from \$5 to \$20 a ton. Rich veins of gold quartz are also found, as in the Beveridge district, at the Brown Monster mine and its vicinity, and also at Chrysopolis. Cerro Gordo and its vicinity, including Swansea, should be, to-day, one of the busiest and greatest bullion-producing districts on the Pacific coast. And it will be when capital is invested, the mine opened, and mills and furnaces erected. In Cerro Gordo the Union mine has produced its millions, and is not half worked out. This is the only mine in this district that has ever been explored to any great extent, about 900 feet being its deepest workings. The Ygnacio comes next, with a development of about 350 feet in depth, and it shows from three to five thousand tons of ore in sight. The Buena Vista, recently bonded to San Francisco parties, on which work was lately commenced, is already showing an immense body of ore over 50 feet in width. Numerous other claims which have been prospected to the extent of the means of the poor prospector, are showing rich bodies of ore.

A rich mineral belt extends north from Cerro Gordo, about 8 miles; its formation and metal-bearing portion being almost identically the same as that of the Ygnacio. At a point on this belt, 8 miles from Cerro Gordo, and about 7 miles from Swansea Station, on Owens Lake, a number of locations have been made, and some of them prospected, which promise to be of great value. In the foot-hills near the lake, and in the vicinity of Swansea, large bodies of smelting ore are being found. It is here that the Indiana, or Boleyl & Tuttle mine is situated, which has produced the richest silver ore ever found in this county—averaging over \$500 per ton. The Flagstaff and others containing the same class of ores are also situated in this neighborhood. North of Swansea and opposite Lone Pine is another section, rich in gold, silver, and lead; several locations have been made here, and some of them sold to New York parties. Passing north to the Brown Monster mine, which is a largely developed and valuable gold mine, we have a number of veins of rich gold-bearing quartz. In this vicinity the Stonewall Jackson, the Hirsh and the Waco Star, are situated, all carrying free gold. From this point north to the head of Mazourka Cañon and Chrysopolis, hundreds of claims have been located. Some of them have been prospected enough to show veins and bodies of rich ores, of both milling and smelting character. Deep Spring district comes next, on the northern end of the range, with its large and prominent ledges of gold and silver bearing ores.

In Mazourka Cañon the formation is such as to allow large bodies of ore to be found, especially of the argentiferous lead ores, which occur in masses of greater or less magnitude, being imbedded in soft formations of lime and argillaceous earths.

The mines reporting were: Champion, Hitchcock, Modoc, Custer, New Coso, Del Monte, Maggie, Panamint, Hidalgo, El Plano, Porrenir, Buena Vista, Rosario, Virginia, Juarez, Los Angeles, Santiago, Guadalupe, Santa Barbara, Piute Mill, Coso, Borego Branch, Golden Star, Indiana, and Freeburn Cañon. The amount produced from these mines was: Gold, \$57,248; silver, \$165,316; total, \$222,564.

KERN COUNTY.

In it is done considerable pocket mining, and such as is of a transitory nature, rendering it difficult to secure the total production of the precious metals.

Several mines in the vicinity of Bakersfield, that have long been lying idle, are again being opened—notably the Way Up, which shows a well-developed ledge of quartz which assays \$50 per ton.

The Dead Beat is a new discovery, with most excellent prospects.

The ore in the vicinity of Bakersfield is worked by arastras, which, although a slow process, saves, it is claimed, a much larger percentage of gold than by the milling process.

At Havilah, the New World is running a deep tunnel, with the expectation of striking rich ore bodies.

Valuable gold ledges have been recently discovered on White River, out of which sufficient ore has been extracted to give a good estimate of their value, the result being as follows: Gold, \$5 per ton; silver, \$2.25; copper, 7 per cent.

The best prospecting ground in this county is at White River, along the base of the Big Blue Mountain.

The mines which have reported are: Warrington Gold, Pah Ute, Tom Lane, and the Anthrum. These three mines produced (with \$9,500 gold produced by Chinese), gold, \$94,214; silver, \$390; total, \$94,604.

LOS ANGELES COUNTY.

Its supposed great mineral wealth is now being developed in the following districts. At Tacopa is the Los Angeles mine, the largest producer in the county. At Ravenna are the Josephine and Union mines, both of which have excellent future prospects. In this district, however, work progresses slowly, as the men now there have not sufficient capital to open their claims fairly. Here there are no mills or smelters, nothing but arastras. New discoveries are the Edward, Hope, and Bainbridge. From Anaheim we learn that there are in the vicinity of Santiago Cañon some very encouraging claims in course of development.

The Santiago Gold and Silver Mining Company are getting from their claim or mine a very good quality of argentiferous galena ore, assaying from \$95 to \$390 per ton. The location of first work was only a short distance below croppings, and the thickness of the vein matter 44 inches. This company is now constructing a lower tunnel, which will test the value of the claim. Until quantity be ascertained it can only be hoped that the future prospect is favorable. In a short time the company will have completed works for reducing their ores, when the output will be comparatively greater than for the past season.

In Silverado district the Blue Light Mining Company now includes, by purchase, Thistlewaite and Harvey, Dunlap Blue Light, and the Flanagan Blue Light mining claims, of 500 feet each. These mines connect, and are beautifully situated for working. The ore veins are accessible, and assay high. This company has no machinery, and is at

present making little progress, expecting to negotiate for additional capital.

But three mines have made reports, Josephine, Union, and Los Angeles, the total production of which was: Gold, \$7,700; silver, \$66,300; total, \$74,000.

STANISLAUS COUNTY.

The placers along the principal rivers were once very productive, and they are now worked in a few places with satisfactory results.

The only locality which sends us any positive information in regard to the mining industry is that in the vicinity of La Grange, on the eastern verge of the county, and near its southern boundary line. At this place the La Grange Ditch and Hydraulic Mining Company produces a large amount of gold, and is, in fact, the only mine of any importance in this county.

Only one mine reported, the production of which (with \$10,621 gold reported as produced by Chinese) was \$73,271, gold.

SACRAMENTO COUNTY.

The principal mining industry of this county is now carried on in the foot-hills of the Sierras, at Michigan Bar, on the North Fork of the Sacramento River, and at Folsom, on the American River. At Michigan Bar, the Amador and Sacramento Canal Company make the largest returns of bullion in the county. At Folsom, the Anderson is the principal producer at present. The Hammer and Millgate Mining Company was arrested in its very remarkable development by litigation. It is an old abandoned mining camp, at Wall's Diggings, which had not been worked for quartz for over twelve years previous to Mr. Hammer's operations. Upon the adjustment of the legal questions operations will be renewed with increased vigor, which will no doubt make this one of the famous mines of the State.

Prospecting is going on here favorably, and, in the opinion of various mining experts, the district is likely to become a rich quartz-bearing region.

The Zimmerman and Wagstem Quartz mine is looking very favorably. The rock is well impregnated with sulphurets and free gold.

Returns have been received from seven mines, chief of which are the Sacramento Canal Company, the Anderson, and the Hammer and Millgate.

The following mines have reported: Amador and Sacramento Canal, Carrigan and Fitzpatrick, Donovan, Humphrey, Rigney, Hammer and Millgate, and Anderson. Their production (with \$202,000 produced by Chinese) was \$342,514, gold.

SAN BERNARDINO COUNTY.

The rich deposits of this county have been but partially developed, and we have no official returns of production. Recent enterprises are meeting with encouraging success and several new mining camps have been started. Fifty miles from Colton, in Cottonwood mining district, are the Alabama and the Hunkey Mining Companies. Here some new claims have been located in gold and silver bearing rock whose out-crop ores assay from \$17 to \$40. Adjoining this is Blue Jacket district, and about 80 miles from Cottonwood is the camp of Dry Lake. Here are several lodes of rock rich in gold and silver, namely, the Desert Chief, Oriflamme,

Ajax, Wonder, Hurricane, Dexter, and some thirty other claims. Shafts are sinking in the Oriflamme and Desert Chief, and it is represented that these mines will soon become heavy producers of bullion, and that the district bids fair to become one of the most promising in California.

In the Temescal range, in the southern corner of the county, where tin is abundant, are also several gold-bearing ledges, recently discovered, which are now prospected with favorable results. There are no mills or smelters near Temescal.

Twenty-five miles south of Riverside a gold claim is opening with good prospects, as the rock grows richer as the shaft goes down.

The new mines at Mohave are attracting attention by the abundance and richness of the ores, which are black oxide of silver in copper-stained quartz.

A new ledge is reported in the neighborhood of San Jacinto. The principal mining excitement, however, now centers in San Bernardino Cañon, where many new discoveries are reported, and the thriving mining camp is receiving daily accessions. The ore assays high and the free milling qualities upset the old theory that there are nothing but rebellious ores in this county. It is safe to predict that San Bernardino will make a respectable exhibit a year hence as a producer of bullion.

MENDOCINO COUNTY.

The placers of this county are still undeveloped through the prevalent scarcity of water. The advices are very meager, and there are returns from but one mine, and in this, which is near Hapland, there is found much platinum and a strong trace of quicksilver. The water used in this mine was obtained from a small ravine, and consequently only surface prospects were used.

There are no new new mines reported, and very little interest is felt in the mining interest of this county. Only one mine has rendered a report, the production of which was: Gold, \$733; silver, \$125; total, \$858.

MERCED COUNTY.

The mining industry of this county is entirely in the hands of Chinese. We have returns from no other source, and no information whatever as to the present or prospective condition of mining interests.

The only reports which have been received from mines operating in this county are in relation to the production by Chinese, which amounted to \$17,515 gold.

NAPA COUNTY.

We have no returns from this county, although there is some bullion produced within its boundaries, and it has some mines upon which considerable work is being done in the way of prospecting.

It has been ascertained that the ore taken from Ida Easely mine is sufficiently rich to warrant the continuance of the work. The ore crushed at a recent trial proved to be worth \$12 per ton. It is very easily mined, and thousands of tons can be taken from it before the expense of mining will be increased to an appreciable extent. At present the 10-stamp mill of the Old Calistoga Gold and Silver Mining Company is being used. With a mill having 12 tons capacity per day, near the mine, ore could be mined and milled at a cost of not to exceed \$5 per ton.

SAN DIEGO COUNTY.

No information of any importance is gained by correspondence with miners of this county. The principal mining camps are at Julian, Banner, and El Rio.

The Yuma Mill and Mining Company, at El Rio, is by far the largest producer in the county, and the next to it is the Hubbert.

The following mines have reported: Yuma Mill and Mining Company, Hubbert, Cable, Hayden, and El Dorado. Their production was \$81,558, gold.

VENTURA COUNTY.

Although both placer and quartz veins are known to exist, there is little done towards their development. We have returns from only one mine of gold, \$354, making this the least productive county in this State.

LASSEN COUNTY.

The only mines which report production to us are those tributary to Hayden Hill. Chief of these is the Juniper, owned by McFarland, Cyrus & Harvey.

Work on all the mines, except the Golden Eagle and the Juniper, is suspended for the present.

The Brush Hill Mill Company is building a new water wheel, which is a 23-foot overshot. It has increased its mining force, and will soon be ready to mill from its own mine, in which there is plenty of rich ore in sight.

The new mines opened this year are the New Hope and I Don't Care, which are being developed with encouraging success. Work is progressing on the Diamond Mountain mines, with flattering developments.

Only three mines have reported, viz: Hopkins Consolidated, I Don't Care, Juniper. Their production was \$25,900, all of which was gold.

FRESNO COUNTY.

Near Fresno some small placers are now worked that produce from \$10 to \$25 per week.

The mines at Fine Gold Gulch continue to develop well and prospecting is going on at the various locations in this district.

Some rich discoveries have been made at Maderi, and at Sampson Flat the mines are very active; here a 10-stamp mill is being built, which, in connection with a number of arastras now operating, will increase the bullion shipments largely it is thought.

The Fresno Enterprise is the most productive mine in this county.

Only three mines reported in this county, viz: Fresno Enterprise, Mountain View, and Aber. Their total production was \$143,433, all gold.

TEHAMA COUNTY

Is almost non-productive in precious metals. We have returns from one mine, at Butte Meadows, of gold \$1,500.

MODOC COUNTY.

The only mining camp in this county of which any information has been received is that at Adin.

Mr. John McFarling, of the Juniper, the principal mine in this county, says that the prospects of the camp are better than ever before. He reports one new mine owned by Messrs. Fairfield & Co., which promises to become a good yielder.

There are three mills in the camp and four or five arastras. No Chinese are engaged in mining.

Only one mine has reported, with a production of \$10,000 gold.

COLUSA COUNTY.

The production of precious metals is very limited in this county.

The only mines of which any information has been gained are the Manzanita and the Monticello. These are near the town of Sulphur Creek.

The Manzanita has a quartz mill run by steam. It is of 10 stamps capacity. The Monticello has four arastras, of some 4 feet in diameter, run by water power.

There are no reports of new discoveries nor of any Chinese at work on the mines in this county. But two mines made reports. They produced: Gold, \$4,830; silver, \$78; total, \$4,908.

HUMBOLDT COUNTY.

The mines are chiefly in the placers of the Klamath and Trinity Rivers. On the latter stream several hydraulic claims have been lately put in shape for active working, the money for the purpose having been mostly furnished by California parties.

The mining lands of Willow Creek are good and only want capital and energy to make them productive.

Returns come mostly from the mines tributary to the towns of Trinidad, Orleans Bar, and China Flat.

The bad weather of last winter interfered with mining operations at Orleans Bar and better prospects are reported this season.

From China Flat the outlook is very encouraging, with an increased out-put. The Chinese are working in the placers in different parts of the county, but their operations are so scattered that there are no means of gaining any trustworthy information of their production.

The Lower Gold Bluff is the largest yielder in the county, and the next to it is Lower Gold Bluff No. 2.

The following mines reported production, viz: Savovam Bar, Union Gold Bluff, Bristol, Widder, Markeson & Kemdson, Newman Placer, Kirk & Sinclair, J. A. Pearch, Lower Gold Bluff, Ullathone, Big Bar, Saints Rest, Thompson, Raccoon Bar, Black Hawk, and China Flat. The amount produced from the mines named was: Gold, \$153,940; silver, \$80; total, \$154,020.

DEL NORTE COUNTY.

The mines, although little developed, offer tempting inducements to the miner. The argentiferous ores are of high grade, and water is in large supply and easily introduced into the mines, which makes the conditions good for successful mining. There is no trouble as regards outlet, disposition of *débris*, the occurrence of indurated cement, volcanic croppings, barren material, or the other obstacles which so often defeat successful hydraulic operations in the older and more central mining counties.

Happy Camp, in the eastern part of the county, is at present the seat of principal mining industry. Here is the Happy Camp Hydraulic Company, the only mine of considerable production in the county, with the exception of the mine owned by Messrs. Temple & Childs.

It is reported that a project is now forming to construct a tunnel which shall divert the water of the Klamath River at this camp, and leave exposed some 7 miles of its present channel, which is said to be very rich in gold.

At Big Flat, work is going on in the Big Flat Gold Mining Company's mine. This camp is accessible only by a rough mountain trail from Crescent City, 30 miles distant.

A discovery of a rich vein of free gold-bearing quartz is reported in the Del Norte mine, at Bald Hill, also of a quartz ledge at Sawyer's Bar, which is holding out as the shaft goes down.

The Chinese made shipments of gold from Classic City of \$2,000 in gold, although their production is supposed to be much greater for the entire county.

The mines reporting were: Richard, Happy Camp, Classic Hill, Hartman Bar, and Bunker Hill. Their production (including \$2,000 in gold produced by Chinese) was: Gold, \$215,403; silver, \$300; total, \$215,703.

MARIPOSA COUNTY.

In this county, the seat of the Fremont grant, mining operations are adding increased facilities for production and transportation, and the condition is one of general activity. At Hornitas the Silver Lead mine is now sinking a shaft and perfecting their machinery with a view to prospecting a narrow vein of very rich ore.

The Washington Mill, of 30 stamps, which has run on low grade ore for seventeen years, is now sinking a shaft below 1,200 feet.

The Yosemite Mill and Mining Company, 2 miles from Hornitas, is composed of New York gentlemen, who are now building an elaborate 30-stamp mill, which is said to be the best in the State. The mine is a true fissure vein, trend north and south, dip east, indicates 25° first 150 feet, now going at 55°. The vein is from 3 to 9 feet, with occasional large deposits. The average working tests, \$9 per ton of free gold. Sulphurets are good and in great abundance. A tramway connects the mine and mill in a very convenient manner. The cost of milling is estimated at \$2.25 per ton.

At Coulterville the Compromise is hoisting ore freely, which is of good quality. There is only one small mill of 4-stamps capacity in the vicinity of this mine. The Eureka Mine is now producing and reducing ore with one arrastra, with prospects of larger production when its new stamp mill is in operation.

The Bendarita is running a tunnel. Its mill is now idle.

The Martin Walling Mining Company report plenty of ore in sight, and are now erecting a mill.

At Hite's Cove the Cranberry mine has been prospecting and making developments before putting up reduction works and completing their mill.

The Ferguson mine, some 2 miles above the junction of the Merced and South Fork, has been put on a paying basis by a company of Sonora gentlemen, who repaired the mine and have built a mill. New hoisting machinery has been added, and a shaft sunk, which has reached a depth of over 50 feet below the 200-foot level, which goes into the very heart of the Ferguson ore body. The vein is from 2½ to 5 feet wide, carrying gold

and galena and other sulphurets all through the quartz. The 300-foot level will be reached by January 1, 1881, and a prolific ore body opened out for systematic stoping. Gold is found in larger particles as the sinking proceeds.

Improvements are reported in the Hite mine. The South Hite Mining Company are making developments on their 500-foot level, which shows a continuous chute of ore from the croppings down to that point. They are now sinking the Gergin Point shaft and are running several levels and cross-cuts.

The Hoosic mine, located just east of the South Hite, is now making a clean up of the rich ores yielded from its 60-foot tunnel.

Communication with the Cranberry and the Ferguson mines has been hitherto by the way of Coulterville and Sonora; hereafter it will be by the way of Mariposa and Hite's Cave, a much shorter and more practicable route.

Tioga Mining district is at the headwaters of the Tuolumne River, near the line dividing Mariposa from Mono County, and about 30 miles east of the Yosemite Valley. The Briskey ledges and the river ledges have been partially explored, and several claims located near the well-known Fuller mine. The reputation of prospectors here is based on their assertions that the assays are rich, the metalliferous vein broad, and the whole ledge undoubtedly connected with the Comstock lode.

There are also abundant supplies of wood and water, and the location is easily accessible at a moderate expense.

A new road is to be constructed which will open up the comparatively undeveloped region lying just north of the water-shed dividing Whittlock's and Shirlock's from Mariposa Creek.

The placers of this county have yielded in past years a vast amount of gold, and enough prospecting has been done to prove the richness of its quartz veins.

About 5 miles west of Bear Valley, on the Merced River, are the great tunnel and the Benton mills of the Mariposa Land and Mining Company of California and New York. This property was formerly a part of the old Fremont grant. The company has built a dam which affords an immense water power, by which the machinery of a 40-stamp mill, two compressors, and other works are moved. This is likely the finest water privilege in the State. This company report the product of the Sucedo and the Mexican mines.

The Sucedo is located under the croppings of the Specimen mine, which produced a large amount of gold in early days. It is in the line of Pine Tree and the Josephine mines on the Mariposa estate.

The Mariposa tunnel, begun on the Merced River a few years ago, will develop a series of mines lying on the line of Pine Tree, and farther on.

Pine Tree and Josephine have produced much bullion, and big bonanzas are anticipated when 1,000 feet or thereabouts is reached.

The Mexican mine is opened by a shaft already 120 feet deep, which will be continued to a depth of 500 feet. The amount of bullion taken out is encouraging, and the company expects to find some large pockets, as in the same line farther north rich deposits were found in the Oro mine.

A mile below the Benton mills the Merced Hydraulic Mining Company are engaged in enterprises which attract considerable attention. They have a complete outfit of first-class machinery, and are adding to their water supply by dredging a ditch and constructing a large reservoir in Flyaway Gulch, a mile and a half from the works. They will

also build a flume 2 miles long to bring the water from the Benton dam.

A rich strike is reported on Temperance Creek, in Hunter's Valley, near the old Oaks and Reese mine, and very recently some Mexicans are said to have discovered a rich quartz vein in the vicinity of the Feleciana mine, likely a continuation of the same vein.

The Hite Gold mine is the largest producer for the fiscal year.

The following named mines have reported: Mariposa Land, Hite Gold, Bernell, Pool, Mexican, Succedo, Benderita, and Eureka. The total production of the mines was: Gold, \$150,017; silver, \$1,300; total \$151,317.

MONO COUNTY.

The official returns from the mines of this county show an excess of production over any other county in the State, surpassing that of Nevada County, however, by only some \$200,000. This large yield of nearly \$3,000,000 is reported by nine mines. The numerous other mines in the county, of which mention is made, have either failed to respond to a request for a statement of production, or are at present in such condition of active development as to be temporarily unproductive.

In Bodie district are the chief mines of the county and some of the largest in the State. There are returns from the Standard Consolidated Bodie Consolidated, Bulwer Consolidated, Noonday, and North Noonday.

The Standard Consolidated is this year the banner mine of California, standing at the head of its many famous mines.

The discovery of Bodie district dates back many years, but the period has been short since it began to make any rapid strides. The following description of the ores of this district is taken from the Nevada Monthly:

Though Bodie is essentially a gold-mining district, the ledges are argentiferous as well as auriferous. All the ores carry more or less silver, and as depth is attained the percentage of silver increases, while the percentage of gold decreases in proportion. In several mines the value of the ores is principally in silver, and some of the best practical miners hold the opinion that ultimately the mines of Bodie district will mainly be worked for silver. The mines of the district are all situated in a huge belt of porphyry, 5 or 6 miles in length and something like a mile in width. This porphyry belt rises out of the hard trachyte, which is the prevailing form of country rock, in a long ridge, along which several hills rear their heads like turrets on a castle wall. The four principal of these are Bodie Bluff, High Peak Hill, Silver Hill, and Queen Bee Hill. The porphyry belt is split up by a vast number of ledges, or, more properly, ore veins, which generally run parallel to each other. The uniform course of the veins is north and south, the same as the porphyry belt, though there are a few exceptions to this rule.

The proposed extension of the Virginia and Truckee Railroad will give mining in Bodie district new and more vigorous life. It will so cheapen the cost of transportation and mining supplies that vast bodies of low grade ore in the district, worth from \$12 to \$20 per ton, now considered unprofitable, can then be worked profitably. The Syndicate, Tioga, Bechtel, Red Cloud and other mines have immense quantities of ore of low grade exposed which the advent of the railroad will make a source of revenue.

The cost of living is very high. Miners' wages are \$4 per day; those of mechanics, from \$5 to \$6.

A correspondent of the Bodie Free Press says:

A year ago the writer took pains to estimate the quantity and quality of the Bodie district ores developed and lying idle above what was then practically determined as the water-level. Since then there has been a great addition made to the bulk of this sort of ore, good, bad, and indifferent, so that altogether the total is sufficient to warrant more milling facilities of consequence. But in this connection comes another element, heretofore dwelt upon; that is, what amount of these ores, and in what manner can they be best made to pay, considering the cost of everything incident thereto? As the country is filled with idle men, willing to work, it would be a good way to employ some hundreds by contract or on tribute to extract these ores. As

the majority of the veins worth anything are of such dimensions as to admit men between walls, which as a rule stand without timbering, the practicability of extracting a vast quantity is unquestionable; ores, too, that would pay to mill. In this connection it may be well to consider what effect the near approach of railroad transportation is going to have; whether the change in favor of more mills, &c., will be adequate to the utilization of this great resource, or whether it must remain in sight, but useless for years to come. It certainly seems reasonable that capitalists, satisfied with a good interest on their money, could not find a better field for erecting and operating custom mill facilities equal to the occasion.

The Standard Consolidated ranks first, as said before, among the dividend-paying mines of the State. "Its claims cover a wide field on Bodie Bluff, and immense ore-bodies are still in sight. Its past and present are too well known to require more than a passing notice. Its almost unparalleled success has given an impulse to mining developments here, the benefits and magnitude of which are as yet scarcely felt, but will be more fully realized from year to year as company after company steps to the front with its dividends. There are now running not less than seven mills, aggregating 120 stamps—the Bulwer-Standard of 30 stamps being a model of its kind on the coast, averaging from month to month its 120 tons per day. The total capacity of all the stamps cannot fall short of 400 tons per day, yet failing to meet the requirements, as there are at least one or two mills in process of erection, and from four to five in contemplation. In addition to this a foundry is in operation, with machine shop connected, prepared to do all kinds of casting and machine work for mills or mines, the cupola and crane of full capacity of heat for all present demands. This establishment is not only a great convenience, but in some cases almost an absolute necessity to the mining companies, which, it is hoped, they may never fail to appreciate." The new shaft has reached a depth of 981 feet; progress for the week, 7 feet. The east cross-cut from the north drift, 700 level, is in 45 feet. The face is still in hard rock. The north drift is in 295 feet; the ledge is 4 feet wide. The east cross-cut, 500 level, has been run since last report 9 feet; total length, 285 feet. North drift No. 1, 385 level, is in 162 feet; progress for the week, 25 feet; the ledge is 5 feet wide. The ledge in the main north drift is 9 feet wide. The stopes look well and yield the usual amount of ore. In the 385 level, north, the ledge is from 15 to 25 feet wide.

The Bodie Consolidated is second to the Standard in production. The following is its present condition: On the 6th incline level the south drift gained 18 feet and the opposite north drift 21 feet. The length of the former drift is now 71 feet and that of the latter 69 feet. In both places the vein has been wide and the ore of excellent quality. In the north drift, upon the hanging wall, they have had a stratum rich in gold. A winze chamber has been cut out from the north drift, fifth incline level, at a distance of about 54 feet north of the east cross-cut. This chamber is now in 10 feet, or within about 3 feet of where the vein will be in the floor thereof. From this latter point a winze will be sunk upon the ore body to connect with the north drift at the sixth level at the place where the winze has been started, and at that point where it will open into the sixth the vein carries ore of a superior quality. Of the new combination shaft to develop this mine and the Mono the following is learned: "The excavation for the foundation for the pump-bob engine is now completed. It is 76 feet long, 26 feet deep, and 20 feet wide, and will be laid in solid masonry, making it impossible for the machinery secured to ever move from any strain in working the shaft. These works, when completed, will insure the speedy development of these valuable properties to a depth of from

1,500 to 2,000 feet. At a depth of 600 feet cross-cuts can be run into the Bodie and Mono ground, and the Bodie opened at a depth of 100 feet below its now lowest levels." The Mono expects to open up a good ore body running into it from the Bodie, which will be cut by this shaft, known as the Lent shaft. The shaft is now down nearly 400 feet.

The Noonday and North Noonday, located on the southern part of Silver Hill, which have already shipped in the neighborhood of \$300,000, have large ore bodies in sight on the 212, 312, and 412 levels, enough to keep their 40 stamps at work for two years to come. At the 512 level, their deepest workings, the lode is 20 feet wide (all ore), working from \$40 to \$50 per ton. Some of the ore, if selected, would run up to very high figures. At this station, near the vein, the company has a pair of Niles engines, 10 by 12 cylinder, a large 14-inch pump, and giraffes for the incline now down from 60 to 70 feet—the whole run by compressed air, which will much facilitate further sinking and the extracting of ore from the lower levels.

The Red Cloud, which is under the management of the Noonday company, is one of the most needed and important enterprises of the district. Taking advantage of the lesson learned by a little Virginia City experience the shaft was located considerably east of Silver Hill, and is now being enlarged to three compartments. It is designed at present principally as a pumping shaft to drain the Noonday and other mines on the ridge, and possibly as a future working shaft when great depth is attained, as the main veins, on this part of the belt at least, have a decided eastern dip. The machinery, which is sufficiently powerful for all demands for many years, is all on the ground and is being put in place with all possible dispatch.

The eastern pitch of the Noonday and Concordia ledges would carry them through that shaft at a depth of 1,200 feet. Its relation to those mines as well as to the Oro, Maybelle, and others, is very favorable. The deeper it is sunk the less distance will it be necessary to cross-cut west to intersect the ledges of those companies. An arrangement has been made between seven companies that the Red Cloud shaft is to be kept down deeper than any of its neighbors, and it is to drain the other mines. To this end it has been enlarged and is now the largest in the district. It has three compartments, the two working compartments being $4\frac{1}{2}$ by 5 and the pump compartment 7 by 5. The hoisting building is 98 feet long by 36 feet wide and 56 feet high. The gallows-frame is 44 feet in height, the timbers being 18 by 24 and the braces 16 by 22. A wing from the hoisting building to the south, for the pumping engine, is 74 feet long by 56 feet wide. A wing in the other direction, for a carpenter shop, is 45 feet long by 35 feet wide. This gives a frontage to the whole, to the east of 165 feet. The blacksmith shop, another building, 40 by 30 feet, is detached from the main works as a precaution against fire. The pumping machinery will be of immense size, it being the design to run a double column of 12-inch pumps with an engine of 500-horse power.

The Bulwer Consolidated consists of 2 ledges, the Ralston or east vein, on the 400 level, from 2 to 4 feet wide, and the Stonewall, 4 feet, at same depth; the ore generally of rather low grade (\$10 to \$20 per ton), the east vein showing some improvement southward.

A winze was sunk 100 feet from this level (400) where stoping has been commenced, and from which is now being extracted some of the richest ore yet found, indicating larger and more concentrated bodies of ore as well as of a better quality at greater depths. No cross-cutting has been done from bottom of winze, and with the exception of a cross-

cut now being run from the 700 level of the Standard shaft to tap both veins this is the only excavation below the 400 level. The total of bullion shipments of mine to date may be set down at \$350,000.

They have any amount of ore above the 400 to keep their mill running for a long time, and with present milling facilities may be able to produce the ensuing year from \$400,000 to \$500,000, but dividends can scarcely be expected before reaching the 700-foot level.

No new mines have been developed the past season, but certain of the mines long worked now give much promise.

The Syndicate, located on the north side of Bodie Bluff, consists of two claims, each 600 feet wide by 1,500 long, and covers several ledges, the principal one 48 feet in width, and running the entire length of the property. The mine is opened by a shaft 550 feet, drifts, and tunnels, the main and longest 2,500 feet, and 700 feet below the surface at its terminus, at which point a shaft is being pushed down 200 feet further with the view of crosscutting the ledges. The ore is represented to be all free milling, and a large quantity has been crushed, yielding an average of \$20 per ton. The Syndicate mill has lately began to crush ore from the Syndicate mine, which is said to be paying much better than was anticipated.

At the Goodshaw, the new hoisting works building, which replaced that destroyed by fire some time since, has been completed. It is now sending ore to the Miners' mill, and is reported to have a large supply thereof in the 600 foot level. The ledge in the west cross-cut is 4 feet wide, of high average grade, assaying \$41.50 per ton, with streaks ranging from \$200 to \$5,000 per ton. All these ledges show a tendency of uniting by depth.

Beethel Consolidated is the direct north extension of the Standard. It is one of the oldest locations of the district, embracing an area of 600 by 1,500 feet, and a vast amount of money has been expended in developing this mine. The old incline workings are about 700 feet in depth, showing inexhaustible bodies of low grade ore in its ramification of drifts. The company are now sinking a new working shaft, two compartment 4 by 4 feet, each close to the northern bounds of the Standard. Commodious hoisting works are erected with powerful machinery, capable of working to a depth of 2,000 feet. This shaft to date is 513 feet in depth. At a depth of 455 feet connection has been made with the Bodie tunnel, and at a depth of 512 feet with the Tioga and Syndicate tunnels. The lowest grade rock in the mine will give a milling average of \$18 per ton; the cost of reduction, including extraction, will not exceed \$10 per ton, leaving a net profit of \$8 per ton, regardless of the future prospects of the present developments. At the 512-foot station a large, convenient station has been made, from which a cross-cut has been run to intersect the three ledges already discovered in the old workings. These ledges vary in width from 3 to 10 feet, dipping slightly to the west, constituting, properly speaking, one body about 165 feet wide, separated by belts of soft, veinous porphyry, with every indication of uniting into one solid, massive ledge, at a depth of 600 or 800 feet. All the ledges present a compact mass of disintegrated quartz, free from admixture, yielding from \$40 to \$60 per ton. A drift is being run along the middle vein, which is, by far, the strongest to connect with the Standard workings. This drift is in now 90 feet from the cross-cut, and continues in strength, with much improvement in the character and value of the ore.

The Belvidere Company are cross-cutting west for their ledge at a depth of 650 feet, and expect to cut it the coming week. As soon as

the ledge is tapped, north and south drifts will be started along the vein, and the extraction of ore commenced. At a depth of 600 feet a drift was run south on the ledge 130 feet; at this point the ledge is 14 feet wide, showing fine grade ore, but a little rebellious under the ordinary process of reduction.

The Consolidated Pacific mine is situated on the southern slope of Bodie Peak. Prior to incorporation a good deal of rich ore was taken from the main ledge by tunneling 100 feet from the surface. After incorporation a winze was sunk 258 feet deep from tunnel level, showing much improvement in the width and character of the ore body. Eighty-one tons of ore were crushed from this winze, which yielded \$4,137.60, or a little over \$51 per ton. Work was discontinued here, and a new double compartment shaft started 486 feet from this winze. This shaft is now 600 feet in depth, with stations cut at 400, 500, and 600 feet in depth. At a depth of 400 feet, 20 feet east of station, the ledge is about 5 feet wide, carrying ore of fair grade. At the 500-foot station the same ledge has increased in width, and the character of the ore of high grade. Drifts have been run north and south on the ledge, which shows much improvement in its southern trend. At the 600-foot level stations are cut east and west of the shaft, and cross-cuts started to intersect the ore bodies, and otherwise thoroughly prospect the property 340 by 1,400 feet.

The Oro mine has a body of ore, rich in sulphurets of silver and iron, carrying about 20 per cent. of the assay value in gold, which requires roasting treatment. Its vein is large, and the prospect of a continuous supply is very encouraging.

There being no smelting or roasting furnaces yet in Bodie a portion of its ore has been shipped to San Francisco for reduction, and the returns were \$206 per ton, mostly silver. This mine has some rich ore in its 300-foot level, but work is suspended until the Red Cloud pumps can drain the water.

The Maryland Consolidated has some five ledges, rock running by assay from \$30 to \$150 (silver and gold), some very rich ore specimens being shown from both the 300 and 500 levels. Their engine cabling is of Robling & Son's best steel, guaranteed to sink 1,500 feet, using cars and cages. Developments go steadily forward. Extracting of ore to commence as soon as the mill in contemplation can be erected.

The Dudley shows the strongest ledge formation, but is low grade, and will require some depth to make it pay; but the most important developments thus far made were in the Concordia, on the west cross-cut 400-foot level of the Red Cloud. This ledge has increased in width from 2 to 10 feet, is 15 feet in depth, both walls well defined and dipping apart with depth in an increased ratio. From wall to wall is one solid mass of quartz, samples of which assay from \$600 to \$6,000 per ton, and will give a milling average of \$65 per ton.

The same ledge formation runs through the East Noonday shaft, which is 300 feet in depth.

Further south work on the Boston Consolidated is progressing rapidly, and making some rich developments, with sufficient ore in the two drifts open to keep a 10-stamp mill busy. The Boston Consolidated is separated from the Last Chance by a double compartment incline shaft, which is 300 feet in depth, with stations at two and three hundred feet. A drift was run along the ledge at the 200-foot level, 345 feet long, showing a continuous stope about 5 feet wide. The ledge shows clearance at the 300-foot level. From this level a drift was run along the west fork, which is 2 feet wide, averaging \$60 per ton. They are now approaching

the point of contact of the two forks, and in a few days expect surprising developments. The company are now making arrangements to erect hoisting machinery and work the mine on an extensive scale.

A little further south are the mining claims of the New York and Bodie Mining Company, comprising seven locations, together with two detached claims west of the Noonday mines. The company are sinking a two-compartment shaft, which is now 150 feet in depth, and neatly timbered the entire distance, having already cut a fine vein of clay and quartz at a depth of 120 feet. It is the intention to sink the shaft 400 feet deep, and then cross-cut for the ledges.

The Queen Bee mine is situated on the eastern slope of the hill, and has a working shaft to the depth of 400 feet. From this station a cross-cut has been run to the ledge, on which a drift has been pushed south 260 feet, and another north 550 feet. The vein is represented as large, carrying some good bunches of ore. Machinery has been provided capable of reaching a depth of 1,500 feet.

The University, on the summit, has been prospected to the depth of 328 feet; five different veins cut, varying from 2 to 22 feet in width; assays of the ore going from a nominal sum to as high as \$900; quartz from the 22-foot vein averaging about \$30 per ton, principally gold. The main shaft, which is now being sunk as fast as the nature of the case will admit, is down about 670 feet, the machinery having a capacity equal to the task of lowering to the depth of 1,800. When the 750 level is reached, a drift will be run for the ledges previously cut.

The Champion's main shaft is 600 feet. In cross-cutting on the 400 level three ledges have been cut, averaging 5 feet in width. A winze has been sunk 160 feet on No. 3 ledge, passing the entire distance through quartz, which has given assays from \$40 to \$200 per ton. On the 580 level two other veins have been cut, the ore represented to assay about \$100. The water is handled by a fine 12-inch double-acting Cornish pump.

The location of the Champion hoisting works is the proper place for pumping machinery to drain the Bodie, Mono, Belvidere, South Bulwer, Goodshaw, Dudley, Addenda, Maybel, and other adjoining mines. The excellent pumping machinery now in the Champion is of an ample capacity to carry down the shaft and accomplish this drainage to the depth of 1,500 feet. This would give these and other mines an opportunity of sinking their shafts and opening up levels to this depth without vexatious delays, and when the great saving is considered of sinking a shaft free from water, as compared with sinking in a deluge that costs at least twice as much per foot, the inference is irresistible that the interest of all concerned would point to some arrangement whereby the drainage could be effected. None of these mines can be worked below the 580 level of the Champion without pumping machinery. This is a self-evident fact, and in the present depressed condition of the stock market but few are able to incur the heavy expense incident to the erection of pumping machinery.

The Addenda.—An incline was originally sunk on the vein 475 feet. The character of the quartz seemed to improve all the way down to the lowest level, where a fine large body of good milling ore was laid bare, similar to that found in the Oro.

For convenience of working, a new three-compartment shaft was afterwards started 300 feet east of the incline, and is now down 520 feet. A station was opened at the 500 level and a cross-cut made to the ledge. The entire distance from wall to wall measures at this point 40 feet; width of pay ore from 7 to 8 feet. A drift has been run some 60 feet on

the lowest level, the whole distance through fine milling ore, some of it more than ordinarily rich in black sulphurets and ruby silver. The average of seven assays was \$278, about 40 per cent. gold and 60 per cent silver. Another station has been opened on the 400 level to connect with the ore chamber in the old works.

The Jupiter has reached a depth of 600 feet. A winze from the 500 level to connect with the main south drift on the 600 finds a regular two-foot ledge all the way down, with an average of ore varying little in value—the last assays running from \$20 to \$160—the ore extracted being estimated at from \$75 to \$100 per ton. Some very rich quartz was found along the footwall, one assay going to \$150 gold and \$4,300 silver, giving a little forecast of the rich strike in the south drift of the 600 level. The fine ore of the 500 level had been known for some time, and expectations had run high as to finding a larger body of this richer ore below.

The Booker, from both the 200 and 300 feet stations, has developed a good strong vein of rather low-grade ore, which it is thought will be eventually worked. A cross-cut is being at present vigorously pushed for the east or principal vein from the 500-foot station. It is likely to be reached at any day, as it has already advanced nearly 300 feet.

In the Spaulding they are stoping on the 100-foot line; they have 140 tons of ore ready to ship to the mill. The mine is sufficiently opened to supply the mill with ore to its full capacity.

In the South Bulwer work is pressed vigorously forward. The north drift of the 550 level has been advanced 10 feet during the week, and the ledge is 6 feet wide in the face, of good milling ore. The walls are strong and well defined, standing nearly vertical, with a slight pitch to the west. The ore is of a bright, lively character, of the same appearance as found in the Standard mine.

In the Tioga a slight increase of water is reported.

Product of bullion for the fiscal year ending June 30, 1880.

Standard Consolidated, Bodie district.....	\$1,654,333 70
Bodie Consolidated, Bodie district.....	735,358 93
Noonday Consolidated, Bodie district	246,049 45
Bulwer consolidated, Bodie district (four months)	100,870 43
The Banks, &c. (scattering)	88,402 49
	<hr/>
	2,825,015 00

	Value per oz.
Standard	\$10 25
Bodie	1 84
Bulwer	10 70
Noonday	4 65
North Noonday	2 62

The following table gives the total production of each of the mines of the district to December 31, 1880:

STANDARD CONSOLIDATED.

1877	\$784,522 80
1878	1,025,383 35
1879	1,448,845 47
1880	1,858,763 46
Total	<hr/>
	5,117,515 08

BODIE CONSOLIDATED.

1878	\$1, 042, 236 80
1879	764, 067 12
1880	429, 817 80
Total.....	2, 236, 121 72

BULWER CONSOLIDATED.

1879	\$241, 094 38
1880	117, 498 33
Total.....	358, 592 71

BECHTEL CONSOLIDATED.

1878	\$58, 634 93
1878—crude bullion in October.....	1, 550 00
1879	11, 506 05
Total.....	71, 690 98

RED CLOUD.

1878	\$1, 927 50
1879	9, 000 00
Total.....	10, 927 50

MEXICAN.

1877	\$2, 000 00
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KATE RODGERS (SUMMIT).

1877	\$1, 500 00
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SITTING BULL.

1879	\$3, 485 09
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SYNDICATE.

1879	\$12, 316 18
1880	24, 769 75
Total	37, 085 93

NOONDAY.

1879	\$36, 532 29
1880	511, 757 21
Total.....	548, 289 50

SCATTERING.

1879	\$39, 000 00
1880	93, 445 26
Total.....	132, 445 26

BELVIDERE.

1880	\$25, 901 26
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46 PRECIOUS METALS IN THE UNITED STATES.

DUDLEY.

1880	\$1,746 06
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SUMMARY OF SHIPMENTS.

1877	\$797,022 80
1878	2,129,732 58
1879	2,556,847 58
1880	3,063,699 13

Total production to December 31, 1880.....	8,547,301 09
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The above production was from the several mines in the following proportion :

Standard	\$5,117,515 08
Bodie	2,236,121 72
Noonday	548,289 50
Bulwer	358,592 71
Bechtel	71,690 98
Syndicate	37,085 93
Belvidere	25,901 26
Red Cloud	10,927 50
Sitting Bull	3,485 09
Mexican	2,000 00
Dudley	1,746 06
Kate Rodgers (Summit)	1,500 00
Scattering	132,445 26
Total	8,547,301 09

SHIPMENTS IN 1878.

Standard	\$1,025,383 35
Bodie	1,042,236 80
Bechtel	58,634 93
Red Cloud	1,927 50
Scattering	1,550 00
Total	2,129,732 58

SHIPMENTS IN 1879.

Standard Consolidated	\$1,448,845 47
Bodie Consolidated	784,057 12
Bulwer Consolidated	241,094 38
Noonday	36,532 29
Syndicate	12,316 38
Bechtel Consolidated	11,506 85
Sitting Bull	3,485 09
Shipments by banks	39,000 00
Total	\$2,556,847 58

SHIPMENTS IN 1880.

Standard Consolidated	\$1,858,763 46
Noonday and North Noonday	511,757 21
Bodie Consolidated	429,817 80
Bulwer Consolidated	117,498 33
Belvidere	25,901 26
Syndicate	24,769 75
Dudley	1,746 06
Scattering	93,445 26
Total	3,063,699 13

COMPARISON.

The following is a comparison, by months, for the past three years :

Month.	1878.	1879.	1880.
January.....	\$111,567 97	\$201,405 25	\$195,713 15
February.....	84,473 50	136,714 44	131,193 43
March.....	78,449 77	189,404 46	266,053 00
April.....	76,619 33	203,541 94	231,055 71
May.....	62,026 15	142,848 20	293,163 12
June.....	85,912 84	302,885 79	265,277 00
July.....	110,075 79	172,813 21	343,835 56
August.....	699,944 33	212,013 10	298,673 53
September.....	317,020 63	286,288 38	218,349 99
October.....	170,398 36	193,249 33	257,114 84
November.....	124,020 69	196,981 23	244,769 81
December.....	209,323 81	275,201 25	325,128 73
Scattering.....		39,000 00	93,445 26
Total.....	2,129,732 58	2,556,847 58	3,063,699 13
Increase in 1880 over 1879			506,851 55
Increase in 1880 over 1878			933,966 55

The following tables show the percentage of gold and silver in the bullion during the past two years :

PERCENTAGE OF GOLD AND SILVER IN 1880.

Corporation.	Gold.	Silver.
Standard Consolidated.....	93	7
Noonday.....	78.52	21.48
North Noonday.....	40.59	59.41
Bodie Consolidated	59.50	41.50
Bulwer Consolidated.....	93	07
Belvidere.....	37	63
Syndicate.....	89	11
Dudley.....	30	70
Scattering banks	95	5

PERCENTAGE OF GOLD AND SILVER IN 1879.

Corporation.	Gold.	Silver.
Standard Consolidated.....	92	8
Bodie Consolidated	85	15
Bulwer Consolidated	92	8
Noonday.....	70	30
Sitting Bull.....	90	10
Syndicate.....	93	7

At Benton are the Vulean and Diana, two of the producing mines of Mono County.

At Mammoth City is the Mammoth mine, which reports production. Improvements are going on busily in this mine, and by the last report tunnel No. 3 has been advanced 11 feet, giving a total length of 1,714 feet. The upraise from this tunnel has been advanced 40 feet; total height, 192 feet. No. 6 cross-cut has been driven 15 feet, the intermediate drift north, 140 feet above No. 3 tunnel, has been advanced 20 feet. The mine has never looked better, and the mill is running steadily to its full capacity, crushing 84 tons of ore per day.

By last advices we learn that the Headlight and Monte Christo tunnel has passed into a fine vein formation, and all indications in the face

show its near approach to the Mammoth ledge, and this may be cut at any moment. The tunnel is now in 1,000 feet, and will cut the ledge at a depth of 900 feet from the surface. The adjoining mines are waiting for developments in the Mammoth, Headlight, and Monte Christo.

There are now over 300 men at work in the mines and timber.

Much work is also being done on Laurel Hill, with excellent prospects.

Lake District.—In the Lisbon mine the ledge crops out at the foot of Mount Parker, and at the point where it was first opened the assays were not very encouraging, but upon sinking the ore was found to improve, and some fine specimens were taken out. A tunnel was then started, which cut the ledge at a depth of about 50 feet from the cropings, at which point the vein had improved so much in size and value that the owners put up an arastra, which they run for several weeks, and took out about \$2,000 in gold, or an average of \$40 per ton for the amount of ore worked; but it was late in the season before they got to work, and the arastra and water-wheel are now frozen up. In the mean time a new tunnel was started in on the ledge and connected with a winze from and about 35 feet below the first tunnel. At this point the ledge was found to be still wider than above, and of increasing richness. The sinking of the winze was resumed, and at the time of our visit was 7 feet below the tunnel level. Here the ledge shows nearly 3 feet wide, is handsomely incased, and carries free gold, visible to the naked eye. And now a new tunnel has been started in on the ledge at the foot of the hill, at the mill-site. Convenient to the mill-site wood and water are abundant. The building of a cabin on the mill-site at the mouth of the lower tunnel was commenced yesterday. The miners will live there, and can push their work through during the winter in spite of the storms. The tunnel will run a distance of about 500 feet.

Homer District.—From a letter to the San Francisco Chronicle the following description of this new mining district is taken:

MILL CREEK (MONO COUNTY, CALIFORNIA), July 8.

The Homer mining district is situated on the east slope of the Sierra Nevada Mountains, about 12 miles from the summit, and is on the headwaters of the Virginia, Laiming, and Mill Creeks. The mineral belt here is extensive, being from 6 to 8 miles in width and can be traced for 20 miles in length, the ledges varying from 1 to 20 feet in width. It was discovered by a man named Homer, from whom the district takes its name, in the latter part of August, 1879. The town of Lundy is southwest from Bodie about 22 miles, and has about three hundred inhabitants. The first discoveries made were Mill Creek cañon, $1\frac{1}{4}$ miles southwest from where the town-site of Lundy now stands. This country, prior to the discovery of gold, never attracted any attention, except from the shepherd who came here every season to find pasture for his flocks, and Lundy, who had an eye to the cutting of Uncle Sam's timber for the Bodie market, for which he erected a sawmill. The first discovered ledge in the district was bought by McClinton, of Bodie, which he incorporated under the name of the Homer Mining and Mill Company, who commenced work and have been developing the property for the past nine months, under the management of Martin Jones, who has placed the mine in the most favorable light to its owners. The May Lundy mine, which is situated in Lake Cañon, is incorporated and has been worked since last January, and shows very rich rock. The company have just completed a trail to the mine, which is about 1,000 feet higher than the waters in the cañon below. The owners of these two promising mines intend to erect mills for their own use, and we hope that before long Homer district will boast of a quartzmill. The Homer Company have already cut the timber for the framework of the mill, which, as soon as the wood is seasoned, will be erected. The Homer Land, Water, Mining and Mill Company have been developing their property for the past four months. This company has twelve or fifteen locations. The first work done by them was on the Taylor prospecting tunnel, but on account of the character of the ground they have suspended work for the present, and have been developing the Cape May, which is situated on the east side of Lake Simon, and shows one of the finest and best defined ledges in the district. This ledge is 4 to 5 feet in width, with soft clay on either side, and is incased in dyarite walls. The

shaft, which is an incline, is down to a depth of 50 feet. They are also working the Buena Vista mine, which shows a ledge of 6 feet on top, and is the north extension of Homer mine, and also the Mono mine, which shows very favorably. This latter mine joins the northern boundary of the Dick Turpin mine, which I understand the company will start three drifts on in a short time. This property is 4,500 feet long, taking in three locations. Superintendent Day, of the Black Fox mine, has returned to Carson and will make arrangements to commence work on their ground. The White Fly mine, which has just been discovered, shows some good specimens of gold and silver bearing rock. It is situated on the east side of the south fork of the Laiming Creek, about $1\frac{1}{2}$ miles from Lake Cañon.

The May Lundy mine is thus described:

For more than 1,000 feet the ledge crops out in huge masses of high grade-quartz. The surface configuration presents every characteristic of a true fissure. So strongly marked is the line of cleavage that it can be accurately traced hundreds of feet away. For over 800 feet south from the north line the ledge bulges out of the ground in a mass of quartz from 12 to 25 feet in width; then it splits into three distinct veins, all of which crop out strongly until the *débris* of the wash covers the croppings from view. South of the wash the ledge again crops out with strength in the Lakeview extension. Almost the entire ledge is milling ore, but much of it is of a somewhat low grade for this district. Through it, however, run streaks of heavy gold sulphuret and free-gold ore that is fabulously rich. These streaks vary from a few inches to several feet in width. At one place on the ledge there are four of those rich ore channels running through it, the largest being fully five feet wide, all ore that assays way up into the hundreds. Twelve miners are at present engaged in taking out and sacking the richest of the ore, which will work at least \$600 per ton. The second-class ore, which will average upwards of \$200 per ton, is piled up for future shipment. At any point on the croppings one can see free gold, though the richest ore is a sulphuret. Some of it carries considerable silver, and several handsome specimens of stephenite have been encountered. Quartz taken from any part of the ledge gives a good prospect when horned. Samples of the ore being sacked were horned, in the presence of the writer, that gave returns equal to \$1,000 and \$2,000 per ton.

More recently we are advised that the May Lundy mill, of five stamps, is completed and running to its full capacity, crushing 10 tons of ore per day. There has been no clean-up as yet, but the pulp gives promise of a rich return. The May Lundy mine is being opened up with astounding rapidity. They have over 1,200 tons of rich ore at the mill. F. W. Pike, superintendent of this mine, is doing scientific work in opening the levels and stopes. His confidence in the district is shown by his works, having just purchased the Lucky Morton and Lake View mines, which he proposes opening in the spring.

The Homer Mill and Mining Company have developed ore enough to justify them in erecting reduction works before the winter weather sets in. They are running both east and west cross-cuts from the tunnel, on which the work of extension is also resumed. The shaft sinking on the rich Wasatch ledge to the east shows well, and it will be connected with the east cross-cut for the purpose of ventilation and ore extraction. It is proposed to erect a 10-stamp mill, with capacity of 20, and run it by water, of which power there is an abundant and convenient supply.

The Little Emma is a new mine of some promise, which is now being energetically worked, and the prospects are that it will soon become a producer of some note.

There are many claims in and about Lundy on which more or less work is being done, but they have as yet produced nothing or but little.

The Dick Turpin bids fair to become a good paying mine.

In Tioga district are the Mary Bee and Yosemite mines, in which there are excellent prospects.

The new mines opened here this season are the Rhine Dollar, Brisky or Lake, the Fuller & Hayt or Golden Crown, the Sunset, and State Ridge.

The following from the Bodie Free Press will be of interest:

Mount Cory and Tarrytown districts.—Mount Cory district is 40 miles north of Bodie, 6 miles south of Mount Grant, and 6 miles west of Hawthorne, the new railroad town on Walker Lake. The district lies between Mount Grant and Mount Cory, and the auriferous ores are found in fissure veins in a micaceous or syenitic granite of a soft character, the fissures having a northerly and southerly trend (a few points east of north and west of south) and an easterly dip, varying from 80 to 65 degrees from the vertical. The Golden Eagle claim has 100 tons of ore out, and a little depth indicates that the dip of the vein will change from east to west. All the veins in the district carry free gold, and the ore is easily reduced. Some time since Thomas Pritchard and Eugene Gallagher, owners of the Big Indian claim, purchased a small grinding pan in Bodie and took it to Mount Cory. The first charge they put in was 500 pounds of ore, which yielded \$66 in gold worth \$17 per ounce. Subsequent charges gave similar returns. What is needed in the district is a 5-stamp mill to do custom work, as most of the claim owners are poor men, but have plenty of rich ore in sight to enable them to prospect their several claims, if they could get returns from their ore. At present there are but three companies working in the Mount Cory district proper, but several others operating at Mount Grant, 6 miles north, and about Squaw Creek, 6 miles south.

Tarrytown district is situated on the eastern slope of the White Mountains, about 4½ miles east of the Mono County line, in Inyo County, California, and about 6 miles west of Deep Spring Valley. This district was organized some time in November last. The mineral belt is some 6½ miles in length by about 1½ miles in width. The formation is lime and slate, the veins or lodes running in a northerly or southerly course, and dip west. The ores are what is known as argentiferous galena, or lead ores, free from any rebellious metals. Seventy-four assays out of as many locations averaged as follows: silver, \$52.80; gold, \$8.30; and 48 per cent. lead per ton. The Heritage mine has done considerable work. A tunnel cuts the vein some 100 feet from the surface, where the lode is some 3½ feet wide, and assays \$124.55 in silver, \$15.60 in gold, and 52 per cent. in lead. A large quantity of this ore is on the dump.

Another valuable property, which has been sunk on in different places, shows a well-defined vein from 3½ to 4 feet of carbonate and chloride ore of high grade, assaying \$121.40 in silver, \$15.12 in gold, and 52 per cent. lead. There are several places on the line of the lode showing a ledge of nearly solid metal 6 feet between the walls. This mine alone is capable of keeping a 40-ton furnace running, with twenty men at the mine. Within 200 yards of the mines is a flat and grassy area of about 100 acres. At the head of this is a spring, which pours out not less than 50 inches of water during the driest seasons. There is also another spring some 100 yards from the mines, which runs some 8 inches. There are not less than 10,000 acres of fine tamarack timber not more than 3 miles from the mines, with a good natural road into the same. There are also thousands of acres of nut-pine timber lower down and near the mines.

Good condition of the Bodie mines.—There are at the present time twenty-one mines in Bodie district that are being actively worked, and all of them in ore. There are seventeen others, having ore in sight, upon which work has been temporarily suspended, and of this number fifteen have steam hoisting works. There are also many other fine prospects in the district upon which sufficient work has not been done to determine their value. Two important developments have been made, and those previously made are holding their own. The Union Consolidated, situated on the northwest slope of the Bodie Bluff, has struck, at a depth of 150 feet, a vein 10 feet in width, giving assays averaging \$100.46. The other strike was made in the south drift, 512-foot level of the Noonday. This drift followed the ore vein (usually about 30 inches wide and of fair milling grade only) 330 feet, where it came into ore running over \$100 to the ton. In going 8 feet further this vein widened to 6 feet of clean ore, all of it being of very high grade. The prospective value of this strike is greatly heightened by the fact that immediately above this body, on the 412-foot level, the ore vein was 35 feet wide, though not of as high grade as on the 512-foot level. The Bodie, as was predicted last week would be the case, shows a still further improvement in the quality of the ore milled. This is due to the fact that the bulk of the ore extracted during the week was taken from and below the sixth (incline) level, which proves conclusively that the Fortuna, or east vein, is growing richer as it descends. Some very rich gold and silver ore was recently struck in the Jupiter mine—the gold passing through and projecting out of the rock in sheets. Boston Consolidated is stopping from the 200-foot level in from 3 to 4 feet of good ore, while the vein followed 305 feet on the 300-foot level proves to be from 3½ to 4 feet wide of good milling ore.

The following mines have made reports: Noonday, Bodie Consolidated, Standard, Mammoth, Vulcan, Diana, North Noonday, Bulwer Consolidated, Indian Queen Milling. Their production was: gold, \$2,-407,236; silver, \$582,905; total, \$2,990,141.

NEVADA COUNTY

Continues its importance among the leading counties of California, although this year the official returns of production place it second to Mono County by some \$2,000,000.

Returns have been made from sixty-three mines which are located in the districts of Grass Valley, Nevada City, North Bloomfield, Moore's Flat, Columbia, Blue Tent, French Corral, You Bet, Rough and Ready, Greenwood, Sweetland, Lowell Hill and Badger Hill, Washington, and Omega.

"There are 45 quartz mills in Nevada County, having an aggregate of 503 stamps, and a crushing capacity of about 750 tons per day. They are divided among the various townships as follows:

"*Nevada*.—Deadwood, Murchie, Merrifield, Providence, Wyoming, Nevada City, Pittsburg, Thomas, Martin & Mitchell, Eureka No. 2, Spargo, Kirkham, Crosby, Keith, Stiles, Sneath & Clay, Pennsylvania. Number of stamps in Nevada township, 153.

"*Grass Valley*.—Idaho, Scadden Flat, Larimer, Omaha, Bullion, O'Connor, Godfrey (cement), Orleans, Coe, Empire, Alpha, Rocky Bar, Allison Ranch. Number of stamps in Grass Valley Township, 180.

"*Eureka*.—Parsons, Birchville, California, Great Republic, Rocky Glen, Booth. Number of stamps in Eureka Township, 78.

"*Washington*.—Patterson, Marker, Yuba, Fall Creek, Diamond Creek. Number of stamps in Washington Township, 60.

"*Rough and Ready*.—Iron-clad, Hudson, Osceola. Number of stamps in Rough and Ready Township, 22.

"*Little York*.—Sargent & Jacobs (cement), 10 stamps.

"The assessed value of mining claims and improvements in the county is \$2,358,640; value of mining ditches, reservoirs, &c., \$1,051,495; total number of mining ditches, 217; number of miles of mining ditches, 824."

Grass Valley is the principal quartz-mining district. Mr. John Godfrey, of the Godfrey gravel mine here, who has furnished much valuable information, says that "although Grass Valley is an old district it has some advantages, and more attention is being given to some of its neglected mines."

In Grass Valley district is situated the well known Idaho mine, which may be considered as one of the representative gold mines in this State. We give some figures concerning this mine from their last annual report, as it will give readers a broad idea of the expense of running such a mine.

After an expenditure of about \$90,000 on the property the Idaho mine commenced paying dividends in 1869, and with but few intermissions has paid regular monthly dividends ever since, the total number of such being 136, amounting to \$2,830,300 out of a total yield in the twelve years of \$6,140,188.02. The yield of the past year has been \$440,445.59, out of which dividends to the amount of \$127,100 have been paid.

There has been paid out in dividends to the stockholders as follows:

Year.	Dividend.	Per cent.	Amount.
1869	11	55	\$170,500
1870	7	12	31,200
1871	12	75	232,500
1872	11	52½	162,750
1873	12	220	683,000
1874	12	102½	317,750
1875	11	55½	172,050
1876	12	82½	255,750
1877	12	77½	240,250
1878	12	85	263,500
1879	12	54½	168,950
1880	12	41	127,100

Being for twelve years 136 dividends aggregating 913 per cent. on the capital stock, and amounting to \$2,830,300.

The ore worked during the year amounted to 28,072 tons. Of this amount 6,270½ came from the 800 level; 134½ from the 900 level; 6,051½ from the 1,000 level; 14,776½ from the 1,100 level; and 739 from the 1,200 level. This gave a yield of—

24,457 ounces of bullion.....	\$426,938 46
68 tons of slime sold.....	1,252 00
Estimated cost working same.....	1,005 00
Tailings worked on shares.....	5,068 12
36½ tons tailing sulphurets.....	4,580 72
50 tons of buddle sulphurets.....	4,317 04
Sold 10½ tons sulphurets.....	689 85
Estimated cost of working same.....	202 50
Specimens sold.....	65 00

\$444,118 69

Yielding an average of \$15.82 per ton; average cost of milling per ton, \$9.29½.

Following is a table of expenses for the year:

Milling, mining, repairing.....	\$260,611 43
Grinding tailing on per cent.....	1,428 17
Exhaust fan for air shaft.....	425 00
Iron bobs for underground.....	719 00
Three plunger poles and castings.....	1,225 00
Steam capstan.....	1,648 64
Sinking incline.....	7,496 00
Prospecting on 1,000 level and cross-cut.....	1,578 25
General account.....	12,821 62
Saving sulphurets.....	2,542 50

Total expenses 290,795 61

The Idaho Quartz is the leading mine here. It has been a large gold producer for many years and is at the present time one of the best in the State. We learn that the product of this mine has shown a marked increase in the last three or four months, and the future prospects are most excellent.

Recent operations are reported in the Idaho as follows:

A new 14-inch pump has been put in the Idaho mine, reaching from the surface to the 700 level, to take the place of the 12-inch pump heretofore in use, which will increase the pumping capacity about 25 per cent. There are also being set up two steam capstans to aid in setting the pumps and making repairs to them when necessary, and as an auxiliary to the big pumping engine when extra power is required. During the extraordinary rains of last April a large amount of surface water had to be contended against, which found its way into the Idaho from the old workings of the Eureka mine, and it was all the Idaho pumps could do to hold the water. In fact, for several days they could not do so, as the pump tanks on the seventh and eighth levels were filled beyond their capacity, and the surplus water that escaped and fell below filled the workings of the mine up to the No. 10 level and interfered with work for some days. By putting in a pump of increased size all the surface water, which is troublesome as far down as the 700 level, can be handled easily and do away with all danger of flooding the mine. From the seventh to the eighth a 9-inch pump will be continued in use, and below the eighth level a 6-inch pump is as large as there is any necessity for.

Parallel to this is the South Idaho, a prospect mine thus far. Mr. E. C. Webster writes of favorable outlook and expresses the opinion that it will equal the Idaho when the shaft has been sunk 200 feet more—down to the pay belt.

The New York Hill mine is reported to be in a very prosperous condition, and most flattering accounts are given of its production and of its frequent dividends. There seems to be every prospect of this becoming one of the leading mines of the county.

"The New York Hill is an early-day location, and up to 1865 had produced not less than half a million in gold. From that date it was permitted to lie idle for several years; but for the last five years it has been worked continuously, and is now paying dividends. The best quartz has been obtained from the 800 down to the 1,000 level, and the opening of the 1,100 level is giving equally good promise. This mine is now worked to a greater depth than has ever been reached by any of the mines along the range mentioned, and the results obtained are strong evidence of the utility of deep working."

The Gazelle Mining Company is developing its property, and has great confidence in its future value. The ledge is 30 feet wide and gives good assays.

The Rocky Bar, now turning out rock of extraordinary richness, adjoins the New York Hill on the north. Reports of the exceeding richness of the strike are frequent, and by latest advices the prospect of continuous yield are good.

The Grass Valley Union makes the following comments:

The strike of remarkable rich gold-bearing quartz in the Rocky Bar mine serves to verify a fact well known to all the old miners of the district of the extent and value of the system of ledges extending along the west bank of Wolf Creek, from Gold Hill to the Allison Ranch, a distance embracing about $2\frac{1}{2}$ miles. From time to time, since the discovery of gold-bearing quartz on Gold Hill in 1850, this belt has produced an enormous amount of gold—an amount that can be counted by millions—a handsome percentage of which was found in just such rich stratifications of which the Rocky Bar now gives an example.

For some time past quartz of extraordinary richness has been coming out of the quartz claim of Ford, McDonald & Mullen, on New York Hill, adjoining the Rocky Bar mine on the west. It is intended to put the rock through the batteries in a short time, but there are several hundred pounds of it which would be of more value to sell for jewelry than to reduce for bullion. The rock was taken out at a depth of 110 feet from the surface. There is much gold in that immediate locality, as shown by the late strike in the Rocky Bar mine, and the regular and large yield of the New York Hill mine, which now pays regular monthly dividends. Beside these claims are those of the Vulcan, Grass Valley, Twilight and Tribute, all contiguous, and on the same rich belt, forming a set of claims that no doubt will all prove of great value. New York Hill and its surroundings is now the point of the greatest interest in the Grass Valley district. Although there has been, from time to time, rock of great richness taken out in the Grass Valley district, we have never seen any equal to that contained in this collection. The late strike in the Rocky Bar was very rich, but this lot surpasses that, as some pieces of a few pounds weight are of the value of \$300 and \$500. No accurate value has been made of the lot of rock, but it is believed that it is worth from \$25,000 to \$30,000. The specimens are truly magnificent, and are a surprise to the oldest and most experienced miners.

The perpendicular shaft of the Vulcan mine has reached a depth of nearly 200 feet. Quartz stringers are found going downward, which indicates near approach to a ledge.

The Empire mine on Ophir Hill has been drained of water to the 800-foot level. The pumps have been at work over three months to accomplish this, owing to a large extent of ground that was opened in the drift and stopes. A number of tributers are at work taking out rock from the levels that are drained. The mine is to be pumped out to the bottom of the 1,200 level and the incline sunk deeper.

The Sebastopol was worked many years ago, but shut down during the Frazer River excitement, and has remained idle until a short time ago. The second clean-up of rock from this mine has been made at Sothorn's Mill, "from a run of 96 tons, which yielded \$22 per ton, not including sulphurets, which at the first clean-up went at the rate of \$59 per ton. The yield of this crushing is a decided improvement on the first one that was made, but it does not yet come up to what is expected from the rock when the regular pay chute, which is being driven for, is reached, and which was found in the upper level. There are now about 100 tons

of quartz on the dump at the mine of the same character as the above, which will be hauled to the mill as soon as the condition of the weather and roads will permit. The Sebastopol is showing very well so far as developments have been made."

Work is going on in the Centennial, at which a very satisfactory clean-up has been made.

At the Scotia mine great improvements have recently been made in the erection of hoisting works, &c. A new "skip" recently manufactured for them at Virginia City is now in use with great success, and was thus described before its reception: This skip is the only one of the kind in this district; and, in fact, but few of them are in use in the State. It is made entirely of steel, is provided with the latest patent eccentric safety clutches, and is self-dumping. The skip will hold about 250 gallons of water, and is calculated to make about four trips per minute up and down the shaft, even when it attains a depth of 150 feet or more. It will be used for hoisting all the dirt, rock, and water from the mine. A 40-horse power engine is now in place, and it is calculated that this engine has a capacity for sinking 1,000 feet. Everything about the mine is progressing favorably, and Mr. Stoddart is confident that nothing is being done in vain. Recent advices report the condition of this mine as follows: In sinking at the Scotia mine a fine stringer has been struck in the shaft, which is very fine in mineral of the right sort. This stringer is about 12 inches thick, and is almost vertical, which causes the shaft, which is perpendicular, to follow it for a good distance. The stringer is yet in the bottom at a depth of 130 feet. Several of the best judges and most experienced mining men have examined the rock from the Scotia shaft, and they all pronounce it to be first-class ore for this old and reliable district of Grass Valley.

The Peabody mine is situated in Rhode Island Ravine and is the southeast extension of the Scotia mine. Work is now being done in the way of getting ready to erect hoisting works and putting things in shape for the reception of the machinery, which will soon be on the ground. Mr. John Tiernay has taken the contract to move the machinery, which is now on the Oakland mine, place it upon the Peabody, and sink the shaft 100 feet in depth. It is understood that the machinery will be driven by water-power, which will be much cheaper than steam, and water can be had to run the hoisting works at all times of the year.

The Dillon, a new find below Allison ranch, continues to show gold below the surface. A local company is negotiating for its purchase, and will proceed to work the claim with a good force of men. The mine is so situated on a hill-side as to be readily worked for hundreds of feet without machinery.

The Alaska, which has lain idle for many years, has been leased by Mr. George Marihart, and work is now going on in this mine.

It is also reported that among the mines the Harteny and the Omaha are soon to be started.

The Godfrey Gravel is an important mine. Mr. Godfrey gives the following information in regard to it:

It is in the immediate vicinity of Grass Valley and crushes the gravel by ordinary mill process, and saves the product by amalgamation. In this we differ with the mills working quartz only that it is simpler—amalgamating plates, an ordinary rifle, and a line of sluices being used, the latter for saving the black sand for the unamalgamated gold it may contain, and what little amalgam that may escape the plates. A Knox pan is used to grind the sand and it is run at a small margin of profit.

The mines sending reports of production here are the Idaho Quartz, New York Hill, Godfrey Gravel, Rocky Bar, Pittsburgh, Centennial, Ford & Mullin, Orleans, Alaska, and Washington.

Nevada City.—The mine giving largest returns from this district is the Murchie. Extensive improvements have been made lately in this mine. New hoisting works have been erected 670 feet west of the old ones. The machinery has a capacity of sinking 1,000 feet. A water compressor is used for drilling and pumping, but the hoisting is done by steam. The new 20-stamp mill, with 8 Frue concentrators, stands about 70 feet from the mouth of the shaft. These improvements have cost \$50,000, and it is estimated that, exclusive of chlorination, the expense of milling will be 60 cents per ton, and of mining \$4 per ton. The mine employs twenty men.

The China Mining Company have made additional purchase of lands and are now running a tunnel for the purpose of developing the whole of their mining lands. The length will be 1,200 feet, and the shaft 160 feet in hard bed-rock. They are running an Ingersol drill, and the mine, which is a deep placer, will soon become a very productive one. It is the second mine at this place in point of production for the fiscal year.

Nearly a year ago the pay chute in Deadwood mine suddenly gave out between the 320 and the 420 foot levels, and since that time assessments have been the order of the day. The pay chute has recently been rediscovered and a small crushing of ore made with satisfactory results. This mine made a good report of production for the year and the managers have now every hope of recovering the money expended in recovering the chute.

The Maltman makes returns of a fine yield for the year.

The Oneida Chief is a new company organized to work the Sneath & Clay mine, which it is doing with much energy.

The Nevada City is steadily producing bullion. A new 8-inch engine has been put in recently, as greater power is needed at the additional depth attained.

The Mohigan gold mine is a steady and a heavy yielder. It has developed two good chutes of pay rock in the west and east drifts, with a combined length of 300 feet.

The Phoenix and Potosi, which have yielded large returns heretofore, are soon to be in operation with a prospective output of some \$15,000 per month.

The Banner mine, east of Nevada City, has been at work putting things in shape to resume the systematic working of the claim. The old Stiles & Tisdale incline, which is 100 feet deep, has been cleaned out and a drift run 10 feet. In the face of the latter a 5-foot ledge of good-looking ore was encountered. As soon as the prospecting of the ground is completed, if everything is satisfactory, the mine will be worked on an extensive scale. Mr. Leahy has met with excellent results in his experiments of sorting over the mammoth waste dump of the Banner, on which work was suspended several years ago. Seven and a half tons of ore picked out from the débris and just crushed paid \$8 per ton in free gold and 20 per cent. in sulphurets, worth at the rate of about \$160 per ton. Mr. Leahy proposes to work over all the ore in the dump, there being many hundred tons of it.

The California and Gold Tunnel Mining Companies have been shut down for some time, but, as both these properties are regarded as being valuable, will soon be reopened.

The Cold Spring Gravel mine is running a bed-rock tunnel large enough to admit the working of mules in taking out gravel. This company owns 400 acres of ancient river channel which pays on an average 75 cents per ton.

The Fortuna is a new mine of much promise. Work at this mine is

progressing favorably. The principal labor now being done is drifting, sinking in the shaft having been stopped for several days. The company is taking out some good ore, and the ledge continues to improve both in size and quality the farther they advance.

It is expected that work will shortly be resumed at the Hirschman mine. This property was purchased last winter from Hirschman and others by F. W. Sterling, of New York. The claim has been lying idle for some time, but arrangements are now being made to shortly commence operations.

The developments in the Mount Auburn quartz mine, owned by C. K. Kerby, and situated two miles northwest of town, are daily becoming encouraging. The ledge proves to be very rich, both on the hanging and foot walls, and contains rich sulphurets and plenty of free gold. The prospects of this claim are of such a bright character that the probabilities are that, ere spring opens, developments on a very large scale will be in progress. The Mount Auburn was opened up many years ago, but was considered worthless by those who spent a little money in trying to develop it. There are many other claims in this vicinity that are now lying idle for the want of small capital to work them, and which would, with systematic and economical working, prove to be valuable mineral resources to the county.

At Gold Flat, in the same mining district, are many promising mines. Six gold mines are under process of development, El Capitan, Live Yankee, Talbot, and two mines owned by A. C. Gillespie & Son.

A consolidation of the El Capitan, Wheal Jane, and Transcript mines in this district has been effected, and reincorporation had under the title of the New York and Boston Gold Mining Company.

The Garden Ledge, one of the mines of Messrs. Gillespie, is now being worked with very encouraging results. They also own the Corinth mine, which is just becoming a good producer.

Several years ago some parties ran a tunnel on Gold Flat to drain a ledge they owned. After advancing some 200 feet they quit there. Recently Messrs. Stephens & Vance relocated the claim, and, after cleaning out the old tunnel, resumed operations in it. A ledge varying from 8 to 20 inches in thickness was found, and from it were taken 10 tons of ore. This has just been crushed at Keith's mill on the plaza, and paid \$27 a ton in free gold and about \$3 in sulphurets.

The New England mine is also in this locality. It has been worked for some years, and is supposed to be a permanent and constantly paying mine.

The Lecompton quartz mine, situated on Deer Creek, has been bonded. This claim was worked previous to 1867, when a flood occurred and washed the machinery away. The amount produced is said to have been in the neighborhood of \$750,000. Some of the ore is said to assay as high as \$2,000 a ton in free gold, the average being about \$50.

New locations here are the Phoenix and Eureka No. 2, both under process of development. The Eureka No 2 is on Deer Creek, three-fourths of a mile east of Meroday City. Its ledge, though not of what is known as high grade ore, yet pays sufficiently well to justify the erection of a 4-stamp mill. The ledge is worked through a tunnel, is large and the ore easily obtained, and, judging from the appearance of the plates below the battery after 24 hours run, promises to yield better results than were anticipated.

A rich strike is said to have been made at the Constitution mine, situated near the Le Compton claim, on the south side of Deer Creek. The ledge is about 1 foot in thickness, and heavily charged with sulphurets.

The rock is very similar to that of the Le Compton. The owners are Messrs. G. G. Allan, O. Maltman, and Myer.

The Providence mine has had a set-back by the burning of its hoisting works, which have just been reconstructed, and the mine is in full operation. If worked to its full capacity a 100-stamp mill could be kept going for years, and employment given to 500 more men than are now employed there.

The Spargo is a new mine of much promise. A 4-stamp mill has been recently erected in it. The mill is situated on Deer Creek, a few hundred yards above the Providence mine. A tunnel has been run in about 300 feet on the ledge, which is of fair size and contains rich sulphurets.

Of the new chlorination works at the Merrifield mine the following description is from the Nevada Transcript:

It has been the custom for years to first crush the rock in the battery, after which it passes over the silvered coppers, when the free gold is caught, and the sulphurets and sand pass to the shaking tables, or, what is still better, Frue's concentrators, where the former is collected and the latter allowed to pass off into the ravines or creeks. The sulphurets are then worked by chlorination. Where the quartz shows free gold instead of sulphurets this plan of working ore will probably be continued. Where, however, the rock is heavily charged with sulphurets it has been practically demonstrated that at least two-thirds of the gold, in the shape of infinitesimal particles of sulphurets, are floated off with the sand and water and are lost. Assays of ore that went as high as \$200 and even \$300 per ton have yielded not more than from \$30 to \$40 per ton by mill process.

At the Merrifield mine on Deer Creek a large proportion of the ore is heavily impregnated with sulphurets, and, notwithstanding the fact that the rock by fire assay showed its value to be hundreds of dollars per ton, yet after working the quartz in the most approved manner by the old process, including the using of Frue's concentrators, it was found that the average pay of the ore was about \$25 per ton, including sulphurets. The owners, believing there was a screw loose somewhere, determined to try a new plan. After the rock passed through the batteries and over the plates it was caught in vats, nothing being allowed to pass off but the water, after which it was taken to the reduction works of the Pioneer Company on Gold Flat, where it was chlorinated and worked the same as sulphurets. Nine tons of ore, of the same quality as that which heretofore paid \$25 per ton, yielded over \$100 per ton, the aggregate amount being nearly \$1,000. They are now satisfied that nearly two-thirds of the gold in the rock was lost by its being carried off with the sediment and water in exceedingly fine particles. No more rich sulphuret rock will be worked in the future at the above-named mine by the old method. As the ore is brought to the surface it is put in a dump by itself, and will be worked by the chlorine process. Over \$12,000 a year will be thus added to the income of the owners of the Merrifield mine.

Since the above was written the drying of the furnace in these chlorination works has been completed, and the first charge of sulphurets put in. The results are proving highly satisfactory. The works, which have a capacity for reducing about 100 tons per month, were erected under the supervision of George G. Allan.

The owners of the Mountaineer mine, near the Providence, have opened up a body of ore that warrants them in immediately erecting a mill, for which the ground is now being cleared. The ore now developed is of low grade, but will doubtless improve with depth.

Messrs. Richards, Johns & Jenkins have started a mining tunnel on Deer Creek, between the Merrifield and Mountaineer locations. They have been at work there for five or six weeks past, and are running for the same ledge on which the Spargo mine is located. They expect to strike it within a few feet farther.

Messrs. Ford, Burns & Erskine, of Nevada City, have located a 6-foot ledge that they recently discovered on Deer Creek above the Lecompton mine. The rock assays from \$13 to \$19.75 a ton, and the ledge is so situated as to be easily worked.

A new mining prospect has been started on Deer Creek, near the Murchie mine. The claim is called the Nautelius, and is the property

of Messrs Frank Young and Beecher Walrath. A tunnel is being run toward the ledge, which is expected to be struck at a short distance. The miners employed are now working on a stringer which shows both free gold and sulphurets.

Some facts concerning the Nevada City district, from the Transcript, will be of interest. This district is about 4 miles long and 3 miles wide, Nevada City being near the center. The mines are situated in granite and slate formations, as well as on the contact between them. The granite extends from 1 mile west of Nevada City to 3 miles east, the slate being to the east and west of these points. Many of the chutes are found to be rich at the surface, but are usually the best and strongest in the lower workings of most of the mines. The lodes average from 2 to 4 feet in thickness. The ore is composed of quartz and sulphurets. The yield in free gold is from \$12 to \$60 a ton, although much "specimen rock" is found that will pay as high as \$20,000 a ton. The ores pay from 1 to 4 per cent. of their gold value in silver. The gold is worth, as it comes from the mills, from \$16 to \$18 an ounce. Sulphurets pay from \$100 to \$1,000 a ton, averaging from \$150 to \$250. The best mines in the district are from 300 to 1,000 feet deep, and all of them are holding their own, while some are improving as sinking progresses. After a mine is properly opened ore can be extracted for from \$2 to \$5 a ton. An ordinary mill-stamp will crush from $1\frac{1}{4}$ to $2\frac{1}{4}$ tons of ore per 24 hours, at a cost varying from \$1 to \$2 a ton. Mining and milling should ordinarily be done for from \$5 to \$7 per ton. Sulphurets can be reduced by the chlorination process at from \$16 to \$20 a ton. The Providence and Merrifield mines have extensive chlorination works of their own, and there are two custom works—Maltuan's and the Pioneer.

The cost of labor at Nevada City, in working the mines, is as follows: Unskilled workers receive from \$2 to \$2.50 per day of 10 hours; miners, in most claims, \$3; millmen and engineers, \$3 to \$4; mechanics, \$3.50 to \$4. Millmen and engineers sometimes work 12-hour shifts. A large portion of the mines work three 8-hour shifts.

Nevada City, Nevada County.—Bullion shipments through the office of Wells, Fargo & Co. for 1880 were as follows:

January	\$63,888
February	67,670
March	61,055
April	82,100
May	105,090
June	126,626
July	133,189
August	131,995
September	133,643
October	156,615
November	105,411
December	100,000
Total for 1880	
Shipping, 1879	1,267,282
Shipping, 1868	1,292,762
.....	1,207,000
Total three years	3,767,044

In regard to these shipments, the Nevada Transcript says that about one-third was from quartz, and the remainder from gravel claims. It does not represent the entire amount of bullion shipped below this city, as a number of prominent mine-owners send their products away through other mediums of transportation.

Among the paying mines in this vicinity may be mentioned the following that have recently made public statements: During the year

1880 the Idaho (quartz) paid dividends amounting to \$127,100. New York Hill (quartz), \$67,000; Excelsior (gravel, situated at Smartsville, in Yuba County, close to the line of Nevada County), \$225,000. If all the paying mines in Nevada County would permit of their annual profits being published, the showing would favorably surprise even the most devoted admirers of the mining industry. The fact is that mine owners are often too anxious to dodge paying their fair proportion of taxes.

The mines reporting production in the Nevada district are the following: Murchie, China, Consolidated Wyoming, Hirschman Gravel, Nevada City, Deadwood Gold, Emma Gold, Maltman, Mohigan, Fortuna, Alpha Hydraulic, Manzanita, Rock Creek, California and Gold Tunnel Company, and some others which are just beginning to yield and have produced as yet a mere nominal sum.

The Citizens' Bank of Nevada City claims that the Chinese in the vicinity have produced \$135,000 in gold.

Rough and Ready.—The Chester mine, which has been lying idle for some time, is again in operation with encouraging prospects.

W. A. Dimond is prospecting some ledges of which encouraging reports are made. They are the Bunker Hill and the Lone Star, the ore from which yields \$75 per ton, with plenty power for working.

The Forlorn Hope has a mill which is operated by water power, crushing ore from its mine which yields \$60 to a good-sized cage.

The Ocola, which has lain idle for some time, is now fitting up and will soon have their new steam mill in operation.

The Iron Clad has a steam mill operating upon good ore from its mine, but there is felt a great want of capital for the proper development of the mine.

Omega.—At this place is Placer and Company's mine, which will have a largely increased production when its new improvements, now under way, are completed.

Washington.—A new mine is reported at this point called Garfield, of which there are conflicting reports, but it is most generally supposed to be a good strike.

The South Yuba Water and Mining Company, of New York, whose property is situated in Nevada and Placer counties, have issued a prospectus of their possessions. This company has made many improvements within the past year. The main tunnel is driven into the mountain side a distance of 700 feet, and the upper is in 300 feet. A winze is being sunk at the mouth of the upper tunnel to strike the lower tunnel 550 feet from the mouth. In this winze there is a strong vein showing well in gold. Richmond power drills have been put into the mine and Frue concentrators in the mill, which is kept running night and day. The main ledge is 4 feet thick and of medium grade. Its canals and ditches are in thorough repair.

Returns come from Washington, of the Fall Creek, Hathaway & Co., and Worthly & Co.'s mines. The Chinese produced at this place \$25,000.

At Scott's Flat, 8 miles from Nevada City, Messrs. Hartung & Hetherington made a most successful run.

The Mackerel Back claim, adjoining the Hettington on the north, has a fine bank of gravel in sight that will prospect from top to bottom. This claim has recently been bonded to San Francisco parties. Besides these two claims, there are several others that are preparing for work. On the other side of the ridge, south, and on the same channel, the Sargent & Jacobs claim is being steadily worked by drifting, and is said to be paying well. East and north of the Sargent & Jacobs is the Wind Up,

owned by a Grass Valley corporation, which is driving a tunnel to tap the channel, and late reports are that they have struck gravel in the face.

At North Bloomfield is the North Bloomfield Gravel mine, the largest producer in the county for this year. This great gravel claim is one of the conspicuous features of California mining. Over 100 men are employed, and nearly 4,000 inches of water are used in the daily washings. The gravel is very rich in the present workings, and the property is in a prosperous condition. This company recently shipped the largest bar of gold ever sent through Wells, Fargo & Co.'s office at North Bloomfield.

The Derbec Blue Gravel is another rich mine here, and is also in a most prosperous condition.

From recent workings there is every prospect that the deepest of rich gravel possesses greater permanency than even its most sanguine friends supposed. It has been cleared of the water that has interfered with operations there recently. As soon as the workings are dry the extraction of the rich deposits of gravel that was struck just before the water came in will begin.

The Ballarat Gravel Mining Company has during the past summer been engaged in running a tunnel from Bloody Run into the ridge which separates that ravine from the Derbec Mining Company's ground. The tunnel, on which work has just been suspended for the winter, is now in a distance of about 200 feet. The owners estimate that it will tap the rich gravel deposits for which they are prospecting at a distance in of from three-fourths of a mile to a mile. The company's land extends down to the vicinity of Lake City, and comprises 700 acres.

The machinery on the Watt Gravel claim has been sold to the owners of the Alaska Quartz mine at Pike City, Sierra County, and is now being removed to that place. Evidently the owners of the Watt have given up all hopes of ever finding the great blue gravel channel on their ground.

Besides those mines here, the Colorado Hill, Walkenshaw, and the Eureka make return of production—the last named a mere nominal sum, as it has been engaged in mining a tunnel with brilliant prospects of its being a productive mine very soon.

The Chinese produced, at North Bloomfield, \$10,000.

At North San Juan, just west of North Bloomfield, is the Eureka Lake and Yuba Canal Mining Company, the third mine in production in the county. The Eureka Lake Company have commenced sinking a shaft between their boarding-house at Columbia Hill and the old town of that name. They are determined to reach bedrock if possible, and if they find good paying ground the company will run a tunnel to its Columbia Hill mines, commencing at the South Yuba River. The company is prospecting their mining ground at the old town to ascertain whether the ground will pay sufficiently to warrant the expense of a tunnel over three miles in extent.

The shaft is now down 90 feet, and is a very large one, 14 feet in width. It has three compartments, separated by strong and durable timbers. The process of sinking is naturally very slow. Blue gravel was struck at the depth of 60 feet, and a good paying ground has been found from top to bottom of shaft. How much deeper the shaft will have to be sunk to reach the bedrock can only be conjectured. The top of the shaft is from 150 to 200 feet lower than the original surface.

Workmen are engaged in prospecting the Broderick mine, situated in Little Grass Valley, and are pushing things ahead in good earnest.

The English company has commenced sinking a shaft in their mine, and have already reached a depth of 50 feet. This company is composed of very energetic men, who intend to make this a large yielder in the near future.

At French Corral, on the Yuba River, south of North Bloomfield, is the Milton Water and Mining Company, the second great mine of the county.

At Sweetland is the Sweetland Creek Mining Company, and several mines which make returns of their production, chief of which is the Ricci, which is near Greenwood. At Blue Tint is the Sailor Flat Hydraulic mine, in which developments are going on with satisfactory results to the owners. A rich strike is reported on the Baker ranch, near the Sailor Flat mine. At You Bet is the Nevada Hydraulic mine, working vigorously and producing a good yield. At Lowell Hill the mining interests are great and the gravel deposits rich and extensive. The Swamp Angel is a flourishing mine. This company has lately sunk a new shaft to reach the bedrock, and will soon begin taking out gravel through the new tunnel. The Wide West mine is working a force of 50 men. Its tunnel is in over 900 feet, and they are taking out gravel that pays \$3 per car load. This mine is located only a short distance to the northwest of the Swamp Angel mine. The tunnel of the Morgan claim is in 1,600 feet, from which good paygravel is being removed.

For some years past S. P. Duvey, of San Francisco, has had a force of men engaged in running a tunnel, penetrating the hill a distance of about 1,000 feet. Recently a very extensive deposit of gravel was found for the first time, which is very rich. The channel developed is the same one from which the Swamp Angel Company has been realizing a large profit for nearly two years.

Meadow Lake.—There has always been very rich float rock found about two miles west of Carlisle and one mile west of Old Man Mountain, in Meadow Lake mining district. This rock has paid by arastra over \$100 per ton as it was picked up on the surface. The ledge from which this float rock came has never been discovered, although it has been searched for by many parties. Recently James Gould, the man who introduced the process of working Meadow Lake ores, and George W. Giffen, commenced a search for the ledge, and after about two months' work they have struck a formation which they think is the right one. H. H. Hartley is still pushing ahead on his mine, the Excelsior, at Meadow Lake. He works his rock by hand, and thereby made a living for himself for the last ten years. Some of the rock in the Excelsior is said to go over \$1,000 per ton. Hartley was the discoverer of the district, and he has remained there ever since.

A New York company has secured a great many claims in this district, and is now working the Badger. They have reached the ledge by means of a tunnel, and have cross-cut it for a distance of 34 feet, all good ore, and at present have no indications of reaching the footwall. The shaft they are now sinking is down 70 feet, in ore all the way, but no cross-cuts have been run to determine the width of the ledge. The first 15 assays made from the croppings and working level averaged a little over \$290 per ton, some of it running as high as \$690. Machinery has been ordered from the East to work the ore, of which they have a vast amount on the dump.

The Mohawk mine, in this district, continues to prospect well, and promises very soon to become a large yielder.

Moore's Flat.—This ridge, which is known as the divide between the South and Middle Yuba Rivers, has proven itself to be rich in the pro-

duction of gold in at least twenty different points, and it is believed to be underlaid by an extensive gold-bearing channel.

The Illinois Mining Company reports encouraging prospects for their mine. All the mines in the vicinity of Moore's Flat are being worked by hydraulic process.

The Wa Yen Company employ about 50 Chinamen. At the old town they are working a promising streak with two monitors. East of the old town they are running a bed-rock tunnel into what is known as the Bell ground (the Ohio, Paradise, Paradise Lost, &c.), and expect to reach the channel about Christmas. They are putting a Burleigh drill in place to assist them in hastening the conclusion of this undertaking. The Wa Yen Company is credited with having cleaned up over \$50,000 last year.

The Boston, at Woolsey's Flat, has been the property of the Eureka Lake Company for three years past, and is under the superintendence of R. McMurray. About 90 men are employed, and six monitors are in use.

The Blue Banks Hydraulic claim was recently sold to parties in Boston, Mass., for \$40,000, and everything is being put in first-class order, and a force of 100 men will soon be at work on this mine. This property has yielded a steady income, although, owing to the limited extent of previous operations, a comparatively small portion of ground has been worked over. The claim can be worked by either the hydraulic or drift process.

Mr. S. L. Blackwell, of Snow Point, is developing a gravel mine with good success. There are also two other claims in his immediate vicinity upon which encouraging work is being done.

There is a large number of prospectors, in gravel, busy within a short distance of Morris Flat, and many of them have first-rate outlooks.

This whole portion of the ridge is in a fair way to regain its old-time reputation as a prolific gold field.

A large number of mines have rendered reports, viz: Idaho, Godfrey, Gravel, Alaska, Quaker Hill, Orleans, Pittsburg, New York Hill, Centennial, Ford & Mellin, Colorado Hill, North Bloomfield, Eureka Lake and Yuba Canal, Derbec Blue Gravel, Alpha Hydraulic Gravel, Hawley Claim, Heichman & Co., Murchie, Wa Yen, Shanghai, Sailor Flat, Milton Waters & Co., Consolidated Wyoming, Murchie, Rock Creek, China, Sherman, Nevada City, Hathaway, Manzanita, Alpha Hydraulic, Eureka, Nevada Hydraulic, Illinois, Poor & Co., Garden Lodge, Corinth, Black, Idaho Quartz, Worthley & Co., Walkinshaw, Portuguese, Sharper, Thomas, Taylor & Clark, Von Bremen, Sweetland Creek, Ricci, Wide West, Williamson, Penders, English Hydraulic, Sill & Quick, Swamp Angel, Emma Gold, California and Gold Tunnel Company, Deadwood Gold, Gillespie, Maltman, Polar Star, Southern Cross, Washington, Rocky Bar, Fall Creek, Place Hydraulic, Fortuna, Mohigan, and Murchie. The total production of these mines, with \$306,000 gold produced by Chinese, was: Gold, \$2,702,362; silver, \$70,144; total, \$2,772,506.

PLACER COUNTY.—Hydraulic and drift mining are the principal branches pursued here, and Placer ranks next to Nevada County in the importance of its hydraulic mining.

The principal mining districts now reporting production are the following: Michigan Bluff, Dutch Flat, Gold Run, Iowa Hill, Yankee Jims, Auburn, Newcastle, and Lincoln.

The chief quartz mining districts are in the vicinity of Auburn. At Dutch Flat and in the neighborhood are immense bodies of auriferous gravel which produce large sums annually.

The past season here and at Gold Run has been prosperous, and by our latest advices the rainy season is heralded with sanguine anticipations as preparations for taking advantage of it have been general and thorough. The Gold Run Ditch Company is the chief one here and makes the second largest return in the county.

The Cañon Creek mine, Indian Hill Cement, and the Sacks all make returns showing a flourishing condition.

The Cement mill, in New Gold Run mine, has been recently started again, work having been suspended on account of the failure of the water. The late rains have started sufficient water to run the mill and work the mine.

At the quartz lode, half a mile below Gold Run, the owners are putting up an arastra for the purpose of testing the rock.

The Diamond Lode is being prospected, an incline having been sunk to a depth of some 30 feet on the lode. This lode is looking well and shows gold all through. The ledge is 5 feet high with streaks of red clay running through and parallel with the ledge. Gold can be obtained from every pan of this clay.

Work has been resumed in the Barker mine at Dutch Flat. A large force of men are engaged running powder drifts, laying water-pipes, and preparing generally to commence hydraulic washing as soon as there is sufficient rain to start a good head of water in the ditches. The superintendent, Mr. F. M. Chadbourn, is a very experienced miner.

It has been three years since any work has been done in this mine, because of the property being in litigation, which has now been settled, and work will now be pushed continuously from this time. This mine has produced large quantities of gold.

The work of running drifts in the Franklin Gravel mine has been suspended, owing to the bad luck in finding pay dirt in the various drifts which have been run from the main shaft during the past year. This mine is on the same gravel bed as other claims which have paid handsomely, but so far the search has been fruitless. It is the opinion of old miners that large pay could be taken out of this mine after a good tunnel had been cut to open up a passage for washing.

The Cedar Creek claim has commenced washing for the first time this season, and expects to get in three runs.

Some parties are engaged in sinking a shaft in Secret Town, on what is supposed to be a rich quartz lode.

The work of repairing the South Yuba Company's ditches is being rapidly pushed ahead, and in a short time the whole line of its ditches will be in a useful condition.

The Polar Star and Southern Cross mines will be started up as soon as the water is turned into these ditches. These mines have been very productive during the year.

The Steep Hollow Gold Mining Company is a new mine, which has just completed its tunnel, and reports a splendid prospect for becoming a good paying mine for many years to come, on a very extensive gravel lode.

The East New York mine reports that they have been driving a tunnel, and are now in 2,000 feet, with most flattering prospects, as the Swamp Angel mine, in Nevada County, which joins theirs on the north, are getting good pay gravel.

A. W. Poole & Co. have just put in operation a 5-stamp quartz mill near the junction of North and South Fork of American River, which has already proved very satisfactory to the owners.

A new mine, the Shady Glen Placer, containing 145 acres, located

near Alta, is being developed by running a tunnel 1,000 feet long in a heretofore unknown gravel channel, which is promising results that will astonish those interested.

The Chinese at Dutch Flat are estimated by Mr. W. P. Nichols to have produced \$83,000 in gold. At Iowa Hill the Independent is the principal mine. Next to this in importance of production are the Morning Star, Indian Cañon, and Orion.

The Strawberry Mining Company here, owned by Messrs. Watts, represent their mine as being in a flourishing condition, and also other mines in their vicinity.

Five miles from Iowa Hill the Giant Gap Company, which is owned in Boston, Mass., is running a tunnel to tap the Blue Lead Channel, above Iowa Hill. The tunnel is in about 700 feet, and is being driven in very energetically. The prospect of its becoming a very rich mine is most encouraging.

The Succor Flat mine, three miles below, has recently found very rich gravel, containing nuggets as high as \$200 each in value.

The Hammil mine, which makes returns, speaks of the excellent prospects in its vicinity for developing now idle gravel claims.

Mrs. A. Hill, the owner of considerable property at Iowa Hill, has commenced the construction of a reservoir in Shirt Tail Cañon for the purpose of storing water enough to protract the supply for that mining district much later in the season.

Damascus is now more prosperous than it has been for years. All its gravel and drift mines are paying well, and new enterprises are being canvassed.

Humbug Cañon.—The construction of a trail to the camps situated on Euchre Bar and Humbug Cañon is an assured fact. There at no distant day will be great centers of quartz mining in this county, and these places will grow into prominence, for the quartz there is exceedingly rich.

Michigan Bluff.—At this place the Hidden Treasure mine is the largest producer. Other mines of importance here are the Rainbow, Big Gun, and Hoffman claim. At the Big Gun a short but very successful mining season has been closed, which has paid its owners better than at any time within ten years. This mine is managed with great skill and has perhaps the best working force of contented miners of any similar enterprise in this State.

Work has been resumed upon the old Washo mine, under the supervision of William Muir, who has some twenty men at work.

Mr. Mitchell has struck rich gravel on his claim adjoining the Rainbow mine. Prospects at Michigan Bluff are reported as being very encouraging for the coming season. At Yankee Jims the new mines are the Sacramento, which is very productive, the Sebastopol, with excellent prospects, and the Cranage Placer, which makes returns of its yield and reports its future as being well assured. The Yankee Jims mine is also producing.

Forest Hill.—No new developments are announced for this place.

The following mines have made returns: Deadwood, Mayflower, Big Spring, and Baltimore.

The strike recently made in the Dardanellis proves to be very rich. The gravel is flecked with gold, and yields from \$1 to \$3 to the pan.

Auburn.—It is reported that quartz mining is becoming an important industry here and in the vicinity.

There has been more prospecting and systematic mining work done

during the past season than at any previous time. As an evidence of this progress there have been six mills built in the district, containing thirty-seven stamps. Experienced quartz miners speak very encouragingly of the future of this class of mining for this locality.

The Decker Mill and Mining Company have been devoting their energies to sinking a shaft, but they make a fair showing of bullion in their returns. The owners report this mine as being in first-class condition and as being in shape to produce largely. A new 5-stamp mill has been completed and making its first crushing. The working shaft is now down nearly 100 feet. The size of the ledge varies from 1 to 6 feet in width. Sulphurets from this mine assay \$360 per ton. Quite a sensation has sprung up in the vicinity of this mine, which may be the means of making other discoveries.

The Conrad Gold Quartz is a new mine, and has not until recently been sufficiently developed to be continuously productive. Some very rich ore is being taken out of the west drift, in which the free gold seems more evenly distributed through the ledge than at any former point. This level has been run 180 feet, east and west, in both extremities of which the ore body is of a good paying character, averaging \$30 per ton in the east drift. Work is being pushed on the west drift, and each foot shows more encouraging developments.

The Auburn and Rock Creek and the Brave mines, situated three miles out from Auburn, embrace the above ledges, in which the veins are from 6 to 10 feet wide. A 20-stamp mill and steam hoisting-works are now being erected.

Mr. E. W. Roberts, the owner of the old Banvard ranch, on which there are some valuable mines, among others the Oro Fino, which he is now developing with immediate success.

The old Taylor mine in the east branch of Baltimore ravine is now crushing ore in its newly-completed 10-stamp mill. It is also running a tunnel intending to tap the ledge, and work it for a time through the tunnel.

Messrs. Gwynn & Goode are at work on their lead on Duncan Hill, and are showing some rock which contains free gold in many places and very rich prospects.

M. Hunter is getting his works in shape to follow the pay chute, when he expects to find some rich rock. All the ledges on Duncan Hill show well and the manner in which some of them are being developed indicates a large increase of bullion production.

The Mammoth Bar mine, on the Middle Fork of the American River near Auburn, reports encouraging prospects. This claim is on the river bed, and it has heretofore been thought impossible to develop its treasures, owing to the great depth of gravel, without an immense outlay of capital. Now, however, strong machinery has been set up on the river bank, and a shaft has been sunk to a depth below the bed of the stream and a bed-rock tunnel run under the channel. Much water has been encountered, which is being removed by large pumps, and the gravel channel is being gradually drained, so that the gravel can soon be brought to the surface. The gravel is 70 feet deep, and thus far averages 75 cents to the pan.

The Conrad Gold Quartz and the Decker are the only mines reporting production from this place. The Chinese have produced \$80,204. A rich strike is reported north of Auburn by Messrs. Nutting & Cooper on the Cogswell place near Clipper Gap, which is creating some excitement in the vicinity.

New Castle.—The New Castle Hydraulic Gold Mining Company makes returns and speaks very hopefully as to future results. This company has opened a fine bank of gravel somewhat cemented in the old channel.

Messrs. Boles & McBride, in making their returns, say that "last summer we were only prospecting in our claim, we flumed a few hundred feet of the river and took out in thirteen days \$7,500, when a freshet came and washed us out. We have now put in 1,000 feet of flume, with derricks, pumps, &c., and expect shortly to take out at least \$30,000."

A good quartz ledge has been recently discovered by Mr. Anton Zantgraf at Rattlesnake Bar, which is represented as being of great value.

Another quartz claim, four miles from the above, is said to have been very recently discovered. It is owned by Messrs. Fulweiler & Craig, of Auburn.

The Chinese have produced \$19,700 at New Castle during the fiscal year.

Pino.—Considerable prospecting is being done here, machinery is going up, and mills are being built.

The quartz mines are the Laird, Alabama, and Chicago, of which the former makes return of production. The Chinese produced at this point \$5,735. At Lincoln is the Crater mine, one of the principal ones in the county.

Some good rock is being taken from the Ohio mine below Ophir, which assays \$500 per ton. This mine, which is below the Crater, was opened last March, and the shaft is now down some 50 feet. Near Colfax the Rising Sun mine is making developments that will prove profitable to its owners, it having struck a continuous ledge of rich ore from the first to the ninth level. The ledge is large and exceedingly rich, and as progress is made farther east the ledge increases in size and in richness also.

Cisco.—Two new mines are reported from this place, the Winner and the North Star, but we have no particulars in regard to their value or prospects.

The Cisco Consolidated Company has just erected a 10-stamp quartz mill on the site of its mine, across the Yuba River, on Red Mountain. This company has an extensive ledge of gold-bearing quartz, which will undoubtedly prove one of the best paying mines in this part of the State at no distant day.

From Bath returns are furnished from the Paragon, one of the important mines of the county, which is a steady yielder with most excellent prospects ahead.

Emigrant Gap.—The Last Chance mine reports its ledge opened by tunnel and shaft in a ledge 3 feet wide, of quartz, showing free gold in paying quantities, which greatly encourages miners in the vicinity. The Diamond Creek Gold and Silver Mining Company has prospects of becoming immediately a very productive mine. The Lost Camp at Blue Canyon, and the Blue Bluff Gravel at Shady Run, make favorable returns of their yield.

The following mines have reported: Dardanelles, Excelsior Deep Gravel, Cedar Creek, Morning Star, Horman, U. S. Grant, Gold Run Ditch, Laird, Crater, Paragon, Hidden Treasure, Julian Golden Gate, Hamil, Cañon Creek, Blue Bluff Gravel, Yankee Jim's, Franklin Gravel, Southern Cross Hydraulic, Polar Star, New Castle Gold, Rainbow, Davis Lloyd, Aurora, Strawberry, Vaughn, Orion, Lost Camp, Georgia Hill, Gilbert, Indian Hill Cement, Sacho, May Flower, Baltimore, Decker, Live Oak, Miller, Hoffman Claim, Big Gun, Conrad Gate Quartz, Creamage, Independent, Bowles & McBride, Big Spring, Indian Cañon, and Moody Cañon. These mines produced, with \$188,639 gold production by Chinese, gold, \$838,133; silver, \$640; total, \$838,773.

PLUMAS COUNTY

Offers special inducements to the prospector. Much of its mountain land has never been touched by the miner's pick, and there are immense channels of gold-bearing gravel awaiting the advent of labor and capital.

The deep mines of Plumas are just beginning to attract attention, and if they are opened as the present outlook would indicate, the county will show an immense increase in bullion yield in the next five years. That these advantages are recognized is proved by her increased production, and the general interest in improvements.

The proposed railroad through Long Valley, Honey Lake, Susanville, Alturas, and west of Goose Lake to Oregon, will bring Plumas County in direct communication with Reno, and assist to develop the mineral resources of the northeastern portion of California.

The principal mine is the Plumas Eureka, in Jennison district, in the southern part of the county, which is yielding heavily and has fine prospects for the future.

An extensive mining operation is being inaugurated in the southern part of the county. A large ditch and flume will carry the water from South Feather River, a short distance below Little Grass Valley, to the Mooreville ridge, and the flume will be 4 by 6 feet. Most of the flume is in Plumas.

Greenville and Quincy are the chief centers of mining industry at present. The district, of which Greenville is the chief town, is located at the north end of the fertile Indian Valley, which is some 3,000 feet above the sea level, and contains some 23,000 acres of cultivated land, producing cereals and vegetables in abundance. Greenville is distant 98 miles northeast of Reno, and can be reached by Orville or Chico, from whence it is 60 miles distant. Over 200 stamps are now running in the district, and many of the rich mining properties are being developed. The mining outlook has not been so encouraging as at present for the past fifteen years. The permanency and the value of the mines of the Greenville district are fully entitled to all the attention now being bestowed upon them. The numerous quartz ledges now being developed are attracting capital, and the district for gold-quartz mining promises to equal any in the State.

In Indian Valley, in the vicinity of Greenville, lies the great quartz dike of this mining section. The large serpentine belt running about northeast and southwest separates the Green Mountain belt from the Indian Valley. On the south side of this serpentine belt is the celebrated Crescent, a mine which has produced an immense amount of bullion. In a direct line is the Green Mountain, one of the best mines now opened in California. It is 6 miles southwest of Greenwich, located on the side of a mountain, 2,000 feet above the valley, to which the ledge has been traced, located, and worked, thereby enabling the mine to be economically operated to the level of the valley by a system of tunnels.

The extensive developments of the Green Mountain mine place it among the permanent producing mines in the State, and it, this year, is the second in amount of production in the county. The following description of the mine will be interesting:

The extent of work done the past summer shows well for the management, and now that the new 60-stamp mill is completed, we can speak of the work more in detail. Thirty-two stamps have been running on this mine the past three years. For two years the company has been pushing work to open the ledge in No. 5 tunnel. This tunnel has been running on the vein about 900 feet, and is now over 2,000 feet in length. It has opened two fine pay chimneys of ore, and the face is within some 80 feet of the main pay body that was worked in No. 4 tunnel. This ore body is greater both as to length

on the vein and extent of backs than any other mine in the county; and few in the State can equal it. The second pay chimney through which the company is now raising from No. 5 shows the ledge to be 12 feet wide, and gives 400 feet of backs to No. 4, and from that point to the surface is 350 feet additional, making 750 feet of standing ore. The quality of gold in the chimney is \$17.52 per ounce, a very fine showing for quartz gold.

As depth is gained on the main pay body of this mine every level shows that the vein is increasing in width. In the No. 4 the vein was 80 feet wide from wall to wall, and a greater width is expected in No. 5. This mine has produced in the last ten years a large amount of bullion, with a very limited crushing capacity, over three quarters of a million dollars, before the purchase by the present owners in June, 1879, since which time the developments have been on a more extensive scale, and have given the splendid results herein mentioned. Prof. W. P. Black, of New York, the eminent expert and mining engineer, who made a thorough examination of the mine last winter, has just completed his second examination, and fully confirms his former high opinion of the permanency and great value of this property, and showing the resources to be years ahead of the increased milling facilities. Another valuable adjunct is the extensive water privileges and the cheapness with which the ore can be handled. No mine in the State can make a better showing. The ore all falls from slopes, is handled through chutes, and we are informed can be delivered in the mill and crushed at an average cost of \$2 per ton. This fine development with such large reserves of ore encouraged the energetic president of the company, Mr. H. C. Bidwell, to complete arrangements the past spring for the erection of sixty stamps additional on the property. With one exception this is the largest gold quartz-mill in the State, and has involved an expenditure of \$60,000. The company now has ninety-two stamps running. The mill is situated at the foot of the mountain, a short distance below No. 6 tunnel, which will give some 400 feet still greater depth on the mine. The mill building to the tramway is 148 feet long and 72 feet in width, complete in all its appointments. The plans were drawn by Mr. Wm. Manson, of the Greenville Iron Works, and it has been erected under the supervision of Mr. Enos Burns, a master mechanic. There are 12 batteries of 5 stamps each, and self ore-feeders to each battery. The stamps are about 800 pounds weight; the aprons are 8 feet long, and width of the mortar. The plates are all silvered, all silver plates also extend down the sluice boxes. The ore is entirely free milling, and the amalgamation is done in the mortars and on the plates. The driving-pulley is 12 feet in diameter, and the belt 36 inches wide, of 5-ply rubber. All the modern improvements in quartz-mill building are combined in this work. The power is furnished by a 6-foot diameter Knight water wheel, under 400 feet pressure, through 11-inch heavy iron pipes. The tramway, by which the ore is delivered to the mill, is a substantial and complete work. It is 900 feet in length, the upper and lower ends being supported by strong trestle-work, and in the center, for some 300 feet, the ties being laid upon the ground. The track is double, and the cars run by wire cable direct into the mill, the track extending the entire length of the dump, whereby the ore can be delivered at any point. No rock-breaker is necessary in this mill, the rock going direct to the ore feeders. The mill dump has a capacity of 1,000 tons of ore, and the mine dump from which the cars are loaded about 800 tons. The company own three contiguous claims, 4,350 feet in length on the vein, also a large timber tract, all held under United States patent.

The Round Valley Water Company is placing 2,500 feet of iron pipe on the line of their water-ditch, to carry past the land slide. New flumes will be constructed for 3 miles, and the ditch will be enlarged to double its capacity. The distance from the reservoir to the Green Mountain mill is 8 miles, and the ditch, when completed, will afford a permanent supply of water for all time without interruption.

Next to Green Mountain are the Cherokee mines, lately opened by a New York company. The yield of the old mines was very large, but they were worked at a disadvantage, and no depth of any consequence was gained. Now, with the help of modern improvements in mining machinery, and with good management, the owners will open up one of the finest mines in the country.

Very recently a fine vein of ore, 8 feet in width, was encountered, of a depth of 40 feet from the surface, in the bottom of their new shaft. The rock is of splendid appearance, and will yield from \$15 to \$40 per ton. Although this mine is so recently opened, it is very much encouraged by its recent developments.

The Plumas National has some valuable developments in their lower

tunnels. The main pay chute is over 600 feet in length, with rich pay still in the face, going west, rich in sulphurets. This mine is now adding seven fine concentrators to collect the sulphurets, and will also erect a furnace and chlorination works. The supply of ore is many years ahead of the present capacity to crush it.

No returns come from the Gold Stripe, although it has been opening a fine body of ore in the western part of the mine. It has completed 15 stamps additional to their former mill capacity of 24 stamps. This mine has been worked for years, and has never failed in making a monthly shipment in all that time. The Indian Valley mine, adjoining the Greenville, "gives promise of soon again being added to the list of producing mines in this district. This mine has always had the reputation of being one of the best in the county, but circumstances have prevented its being worked as its merits deserve. It has lately passed into the hands of some San Francisco gentlemen, who have been prosecuting developments that have opened out a new body of very fine-grade ore, and the probabilities are the mine will be put in shape to be worked at an early date. The two mills will give a capacity of 56 stamps on this and the Union mine adjoining, part of the same property."

The Southern Eureka mine has been purchased by New York capital. The company has made a milling test of its ores, the results of which are most satisfactory. A lower tunnel is now being run, and a steam stamp mill is being erected.

Another valuable property, the Atlantic-Pacific, 1 mile north of the Green Mountain mine and within short distance of other prospective bonanzas, viz, Cherokee, Gold Stripe, Plumas, National, and Crescent, is owned by the same parties. This mine shows one of the finest gold-bearing ledges in Plumas County. Their first tunnel was run 200 feet when they struck a 4-foot ledge. Here they sunk a 25-foot shaft through good ore and drifted to the east 200 feet, and struck another paying ledge of 7 feet, both ore bodies assaying from \$150 to \$40 per ton. It has now about 100 tons of ore on the dumps, all of superior character, with plenty of timber and water for milling and mining purposes in its direct vicinity. The Atlantic and Pacific mine is supposed to have the same ledge, and shows similar geological formations as the Indian Valley mine, for which \$75,000 was refused some time ago.

The Arcadian Mining Company has struck a chimney of very rich rock, and while prospecting has taken out more than enough to pay expenses. The Antelope is running a tunnel to tap their ledge near the Arcadian. It will be seen by these statements that while some new mines are being developed, the chief interest is in the reopening of older claims.

From Taylorville returns are furnished from a number of mines, chief of which is the Spellier and the mine of Mr. W. B. Morton.

Genesee Valley, near here, is eminently a gold-producing region. The metal being diffused throughout in a very fine condition. Ledges, however, exist, and some are worked which give coarse gold and plenty of it. The Genesee Valley Mining Company, which makes returns, speaks of the good prospects in their mine, which has only been worked on a limited scale.

From near Prattville returns are made from the Savercool mine, which has recently changed hands and is being much improved, and a 40-stamp mill added.

Quincy.—The following information has been gathered of the mines on the Spanish Peak Channel, west of town:

The Monte Christo Gold Mining Company, of Chicago, Ill., being a

drift mine, a long tunnel has been run in barren ground until it struck blue gravel carrying gold, which prospects well; but as there are more boulders than gravel, no attempt has been made to wash the gravel. There are at this place other Chicago mines, under process of development, notably, the Tip Top, Wide Awake, and the Hard Pan, all of which are engaged in tunneling.

The Elise mine, in a lower channel on the Spanish Peak, has very flattering prospects in its fine gold and gravel. There can be no doubt but that the Spanish Peak Channel will, in a few years, produce large amounts of gold, as it is one of the best confined and regular fragments of a Pliocene river in existence.

Recently a very important strike has been made in the Spanish Peak mine which bids fair to open a section of the old Blue Lead. The main tunnel is being steadily driven forward. The workmen broke through a few days ago, however, and have since been in pipe clay, with 8 inches of rich blue gravel above the track, and as no shaft has been sunk, it is impossible to say how much is below them. The gravel prospects from 10 to 20 cents to the pan. Fine gravel is also being developed in one of the west cross-cuts, and the outlook generally is encouraging. The drill works well, and the "boulder" spoken of gave a good opportunity to test its merits. With ordinary hand drilling it would have been an endless job to pass through it. The water still continues to run steadily from the tunnel, and lately the volume has not decreased. This strike of water will prove valuable, as there is enough of it, if a reservoir is provided, to wash large quantities of drift dirt, and if it holds out the necessary tanks will be built.

The Deadwood mine is not at present being operated, owing to the proposition of running a new tunnel, or of selling the property, in connection with adjoining ground, which is now bonded to eastern capitalists for \$450,000. It is a most valuable property, and has produced some bullion within the fiscal year.

The Thompson mine is producing, and reports fine prospects ahead.

The Heath Mining Company are erecting machinery on their lately-discovered ledge, which is gold bearing for over 7,000 feet, low grade on the surface, but increasing in richness with depth. They have plenty of timber and water, and the range is capable of an immense development. The ore is free milling, and the ledge is 130 feet deep and 13 feet wide, formation porphyry in the west and in the east; the formation is similar to that of the Comstock, the gold being of a high grade of fineness and coining \$19 per ounce.

It is estimated that this single range could produce gold equal to all the hydraulic claims in Plumas County north of Feather River. The following description of this mining claim is added:

A tremendous basin in the bed rock seems to have been filled with a deposit of quartz and gold-bearing talcose slate, and a break over from this basin has made the rich bed of Greenhorn Creek. The lower rim of the basin is lined with a reef of green boulders of gigantic size. It has been a work of years to get through, but it was accomplished last season, and the last deposit of boulders left behind. The work, however, developed the fact that the basin had not been tapped deep enough, and last fall a tunnel was commenced and pushed through the rim over 500 feet. This tunnel is very substantially timbered, and the flume passes through it. The flume and ground sluices are about three-quarters of a mile in length, and provided with under-currents, &c.: 1,200 feet of 15-inch pipe brings the water to the giant with a pressure of over 200 feet.

The Chinese at Quincy are estimated to have produced \$25,000.

Elizabethtown, north of Quincy, in which the mines were discovered in 1852, was for several years after a very flourishing mining camp.

The bench claims on both sides of the town were notably rich for their deposits, while Emigrant Hill, just above town, turned out large amounts of bullion.

"Betsey Gulch, also very rich, empties into the flat almost directly at the point now being worked. The channels were broken up, running for several hundred feet in some places and then ending abruptly. In places the pay was enormous. The old claims passed from one owner to another, until purchased by Messrs. Loring & Leavitt. They worked in several places, with varying success, until some five years ago, when they concluded to test the flat, and to that end commenced a drain tunnel, which they have been pushing steadily ever since. Thirty-two hundred feet in many places the lagging having to be put in on the top, sides, and bottom, and the cracks battened to keep out the quicksand, which would fill the tunnel in an hour through a crack a quarter of an inch wide. They got into bed rock last winter, and this spring or rather this summer they struck pay. Considerable work has been done since then, and the "pay streak" pretty well developed. They have demonstrated that it is 70 feet in width, and it may be much more, as the cross-tunnel has not found the end of it. The main tunnel has progressed up the flat directly toward Emigrant Hill over 100 feet, all in rich pay. The ground averages about \$20 to the man per day, and will do much more than that when they get into good shape for blocking out. The gold is the regular old-fashioned Elizabethtown lead gold pieces, ranging from a cent to \$50."

"The Bell mine which has since passed into the hands chiefly of citizens of Dubuque, and has been incorporated under the laws of the State of Iowa. In accordance with Mr. Bell's statement, red croppings were visible on the surface, the ledge being laid bare finally, after many long years of search, by following up the gulch and sluicing off the sides of the mountain; the quartz of the lode carrying gold corresponding in every particular with the quartz gold in the gulch below. The company has a first-class 10-stamp mill, and has opened the mine by two tunnels, the upper 700 feet to lower 400 feet—finding good ore in each. It is understood that a quartz nugget was once found in the upper tunnel of 14 ounces, yielding \$100 in gold, and that the mill at one time in a three days run cleaned up as much as \$1,793, giving evidence of some very rich chimneys in connection with large bodies of lower grade ores. Very recently a considerable body of what is thought to be very rich ore has been laid open—the pay chute some 20 feet in width, length not yet ascertained. Quartz of better promise has seldom been met with. The formation is slate and porphyry, and the general surroundings all that could be wished for. The distance in places between walls is 60 feet, the best ore outside of main pay chutes lying along or near one or both walls. If the rich chimneys are followed down and the best ore selected from other portions of the mine, as at present intended, the company has every reason to hope for a good time coming."

At Spanish Ranch the Plumas Mining and Water Company is one of the largest producers in the county.

We have reports from the Quiensabe, the Hallsted, and Buck Creek Flat Mining Companies, which report satisfactory and flattering prospects ahead. The Chinese produced at this place \$22,000.

From Meadow Valley, Mr. I. A. Edman sends returns of his mine, the Diadem, in Eagle Gulch district, and says that he is taking out very rich rock. The quartz mines at this district are now attracting attention, and all are found on the Diadem ledge, "a large lode running through the center of the district, with a general direction of northwest

and southeast and a dip of about 60° to the northeast. The lode is generally much decomposed, the vein stone being magnesia limestone, intersected by innumerable veins of quartz and by veins and masses of talcose rocks. The decomposition of the limestone has changed the ledge into a soft body of yellow and red material which generally contains free gold through its entire mass. The chief explorations on this ledge have been made in the claims of the Diadem Mining Company, in which the ledge was formerly covered by a gravel deposit, worked since 1854, and noted for its richness in coarse gold."

From La Porte it is reported that the hydraulic mines are nearly worked out, although we have reports from two mines returning handsome yields—the Conley & Gowell Consolidated, and the mine of Messrs. Judson, Kingdom & Co. At Crescent Mills the Chinese produced \$13,000.

The following interesting information from the Plumas National in regard to Granite Basin quartz mines, west of Quincy, is added:

There are now about 40 men in the basin, several of whom have families, and who have gone there with the intention of making permanent homes. The mines are all quartz—not a washed gravel stone in the district. It was one of the first mining camps in the county, and the numerous ravines were worked out years ago, and yielded very rich returns for the slow and crude methods of mining in the early times. The gold was all of a character known as "quartz gold," and must have been washed into the gulches from the innumerable ledges which cross them in every direction. Most of the lodes now claimed are comparatively small, ranging from 12 inches to 4 or 5 feet in width, and in most cases the country rock is granite, occasionally one being found with porphyry on one side and granite on the other. Nearly all of them contain a large percentage of gold-bearing sulphurets, and there is no doubt but that these will prove the most valuable portion of the quartz, as soon as the proper method or process for extracting the gold from them is brought into use. At present the gold in the sulphurets is lost. The rock is nearly all rich in free gold, ranging from \$5 to \$50 to the ton, with an occasional "spot" or "bunch" which would pay ten times that. There has never been any thing like a fair test of the rock, and although hundreds of tons have been crushed, it is plain to a practical quartz miner that the returns have not been one-half what they should have been, and the tailings now deposited in the beds of the streams will show a prospect equal to the best rock of many mines in other places.

One of the largest ledges in the district, called the Frenchman ledge, is now owned by the Franklin Company, all of Susanville, Lassen County. The ledge is some 3 feet in width, or that should be about an average, as it runs from 2½ to 6 feet. It was purchased by the present owners from a Frenchman named Lose, who had made it pay well by working the picked rock in an arastra, or pounding the very rich portions in a hand mortar. The present company have had some of the rock crushed since they got possession, and although imperfectly worked it yielded at the rate of \$17 or \$18 per ton. The ledge is well developed to the depth of about 100 feet, is well cased up, and a clay seam is found on one side of it, at every opening. A new tunnel has been started on the west side of the hill, and the grading for a new mill has been done. The mill machinery is expected every day from San Francisco, and will be put up as rapidly as possible. The cars will run from the tunnel directly into the mill, which will be a 10-stamper run by steam. The rock is easily worked, and but very few miners are required to keep a supply for a mill of that capacity. The new company certainly have very flattering prospects, and will probably be running 20 or 30 stamps before another winter after the coming one.

Swan & Ament own the first extension east on the Frenchman ledge, and have taken out considerable money from the little 9-stamp mill. The ledge in their claim has proved fully as good as in the other location, and some of the red sulphurets are wonderfully rich. They have a good property.

Close to the Frenchman is a smaller lode, owned by Jos. Peppin, and named the Basin Beauty. No work has been done on it until lately, but it shows up rich in free gold and at one of the openings a pile of rock is waiting for the crusher, which will give big returns.

Over the hill, about three-quarters of a mile, is situated the 8-stamp quartz mill owned by Rev. A. P. White. This mill has been at work on rock from different ledges, and Mr. White has not worked any rock from his own mine, the Granite, this summer. It is said to be a fine vein, and will make a good showing. Near this is located the Jenny Lind, now idle, owned by Governor Perkins, and the Sparks ledge, both counted good property by the miners in that section. An eastern capitalist

named Parker, is now negotiating for the Sparks Granite, and some others, and if the sale should be made work would commence on them on a grand scale.

A short distance down the ravine is located the Irishmen's ledges, owned by Sullivan & O'Brien. On Tuesday they sold one of their claims to a gentleman named Christy, for \$4,800. This vein is small, but prospects and pays very richly, the rock being worked at present in White's mill. The wall rocks are soft and the quartz is easily mined. O'Brien & Sullivan still retain another ledge across the ravine, which is one of the finest prospects in the basin. A short tunnel has been run, and a small stope put up, showing the lode about 3 feet wide going straight down. A run was made from this rock in an arastra, and from 20 tons the result was 18 ounces. The owners will run a tunnel into it this winter, and propose to put up a mill the first thing in the spring.

Across the creek, on the first extension of the same lode, Mr. Lyttaker has developed an ore body carrying fine sulphurets.

Mr. Morgan Williams, of Susanville, is putting up a new 10-stamp mill to crush rock from his mines, the Homestake and Mexican. He is said to have an abundance of gold quartz, and is sure of success. Lee & Jolly are working a small vein a mile or so from Franklin. It is wonderfully rich, and they work considerably by "hand mortar process," getting \$15 or \$20 per day for their labor. They are storing their rock in the mill dump, and will crush it as soon as the winter storms set in.

Several other ledges have been discovered and located, and show well for the work done. The future of the basin is certainly very promising, and a flourishing mining town is sure to spring up there. There is an abundance of quartz, and rich quartz too, and all that is needed to make it valuable is intelligent management.

Also the following from the same source:

UNDEVELOPED PLUMAS GRAVEL.—While almost every other gravel-bearing section in Plumas is being prospected, and while locations are being made in almost every quarter, we can hear of but little being done towards opening the immense blue gravel channel which follows the course of the Middle Fork. The failure of the Franklin Company to bottom it seemed to put a damper on all other locations, and it has been dropped. It will not be long in this condition. There are unmistakable indications and evidences there of one of the most extensive channels in the mountains, and where it "sloped over" the rim at the Blue Gravel mine it proved itself exceedingly rich. At no other point has gravel been found, the immense river shed being filled to a depth of 200 feet and more with lava. Why don't some company test its merits with a boring machine, such as in use at Spanish Park? The cost would be light, and a few holes bored in the bed-rock would probably prove the existence of rich blue gravel, show the depth and, put the ground in shape to show to capitalists that an investment there would be a paying one. If that section of country had been located in Nevada or Sierra Counties, it would have been bottomed and worked out years ago. Mile after mile of the channel is there waiting for some enterprising capitalists to prove that the bottom can be reached, and when this is demonstrated there will be no trouble in finding owners for the numberless claims that will be located.

Considerable of a "mining breeze" has been raised in the Granite Basin country, Plumas County, during the past few weeks, and quite a number of new men have commenced operating in quartz there. Surveyor Kiddie has been doing some surveying there lately, and from him we learn that the prospect for a big mining camp is very flattering. The ledges are uniform in size and the quartz nearly all of the same character, most of it being filled with sulphurets. Some assays of the sulphurets made lately show as high as \$1,360 per ton.

I am indebted to Mr. D. Van Lennep, of Granite Basin, Plumas County, for the following:

I will mention, with regard to this camp, that it has been known in the early history of gold gulch-mining in California, about twenty years ago; at that time the gold was all washed out of the gulches except in the poorest localities, where Chinamen are still washing the dirt every summer at a small remuneration. Nobody, however, is able to say the amount of gold taken out. A gold ledge called the Mexican was worked also in this vicinity twenty years ago. The rock was reduced by a mill built for the purpose, and said to be one of the first built in California to extract gold. It had a 50-foot overshot water-wheel, wooden stems for the stamps, and square shoes and dies—all heavy and clumsy appliances compared with the improved and simplified machinery of the present time.

A few years ago some new ledges were discovered crossing the gulches, most rich in gold, and for a year or two the old camp has shown signs of life. At the present hour there are two mills with 8 stamps each, of about 850 pounds weight each. One mill with 9 stamps, 5 of which weigh 300 pounds each, and 4 of 200 pounds each. One mill with 4 stamps, 400 pounds each.

Having had an opportunity to try the capacity and effectiveness of the small batteries used in this place, I will more particularly bring them to your notice. Of the two batteries used to crush the rock of the mine, one consists of 4 stamps, weighing each 200 pounds, the other of 5 stamps, weighing each 300 pounds. The stamps are given a fall of about $4\frac{1}{2}$ inches, and made to fall 110 to 120 times in one minute. The cams are single instead of double as in the common California battery. The rock of the mine is about three-fourths of medium hard quartz (that is, neither very brittle nor tough), and one-fourth small pieces of quartz and earthy material. Trials under my eyes have showed that the 200-pound stamps crush about one ton to the stamp in 24 hours, and the larger of 300 pounds stamps crushes about one and a half tons to the stamp in 24 hours. This result is exceedingly satisfactory, considering the easy transportation of the light machinery and the easy handling—two great advantages in mountainous regions. The light batteries do not need the skilled labor of wheelwrights to be put up. The estimate of cost is reduced to more than half of a heavy battery. The gold is extracted in the same way as in large batteries—that is to say, that the free gold is amalgamated in the battery with quicksilver, and by running the pulp on copper plates having a coat of quicksilver or silver amalgam. Rude contrivances to concentrate sulphurets and catch hard amalgam run of the plate consist of coarse sacks laid across the tailings sluice. These sacks are taken out every day or every 12 hours and washed in tanks.

The ledges are mostly in the hands of the discoverers or of persons of small means, and are worked in a small way, giving handsome returns if handled with knowledge. The ledges are small, from 6 inches to 3 and 4 feet wide. Free gold is about from \$3 to \$12 a ton in the rock. The sulphurets are rich, but no attempt has yet been made to work them. The bed-rock is soft granite and cost of extraction small; wood is in great abundance. The camp lies about 4 miles south of the stage road between Oroville and Quincy. Stages running every other day. We are in great need of direct postal communication. There are seven families living here, besides single men.

The following mines have reported: Plumas Eureka, Plumas National, Plumas Mining and Water, Newberry, Bushman, Emma, Lovejoy, High Point, W. B. Morton, Spillier, Franklin Hill, Judson Kingdom & Co., Silver Star Plume, Savercool, Hendel, Diadem, Morton, Moraine & Adams, Acadian, Deadwood, Bell Gold, Cunningham Bros., Conly & Gowell Consolidated, Sears Diggings, East Branch, Erickson & Homestake Claim, Thompson, Brush Creek, Halstead, Green Mountain, Teft, Quicensabe, Grub Flat, and Genesee Valley. These mines report, with \$245,000 produced by Chinese, a production of gold, \$857,124; silver, \$181; total, \$857,305.

SHASTA COUNTY.

The principal mining camps are in the western part of the county, in the neighborhood of Shasta.

The mines of French Gulch district are in a belt of gold-bearing quartz, which, in nearly all cases, is paying well. They are now shipping from \$5,000 to \$8,000 per month, an increase of one-third over last year's shipments for the same period.

The Brown Bear quartz mine is a new discovery in French Gulch. This and the Scorpion, Niagara, Centennial, and Apex are all in process of development, and are paying well for the amount of work bestowed on them. An old tunnel in Scorpion will be cleaned out to tap the ledge 100 feet below, where they are now working with success.

The gold from these mines runs from 800 to 875 fine. There is no silver raised in this district thus far.

The mines at Bully Choop are in good condition. Messrs. Knox & Co., of the Central mine, are running a 5-stamp battery and are crushing two and a half tons of ore per day, which averages \$30 per ton. Their shaft is down 100 feet, and they are now tunneling in a ledge of 5 feet wide in good pay rock.

The Red Bluff mine has a 10-stamp mill constantly running. The Extra Company's mines have been worked by the creditors from January, 1879, to April, 1880. For the present the mines are idle, as the

company must be reorganized before anything more can be done on them. These mines are at Reading, and have produced a large quantity of silver, and the only ones in the county which produce this metal in any considerable amount.

The Dix and Cooper mine of Horsetown are looking for a change in the management of the Clark Creek Ditch Company, to affect their output favorably. The scarcity of water had prevented their working more than sixty days.

The Chicago mine at Shasta has not been worked for a long time until quite recently. It has now completed its mill and will begin to produce. This company is also building a furnace, when the ore will be roasted after it is crushed. They have now over 300 tons on the dump. The ore vein varies from 1 foot to 20 inches in width.

The Peck silver mine, in Iron Mountain, is being prospected with most encouraging prospects of its becoming a good producer in the near future.

The Chinese are very active in this county, and have exhausted nearly all the bars in the Sacramento River as well as those on Dog and Slate creeks. Wherever this race is allowed to work they make a clean sweep of all the precious metals obtainable. The old and once famous Dudley and Churchill mines are now owned and operated by Chinese, with good prospects and with an increased yield over last season.

The following from a correspondent of the Mining and Scientific Press, of San Francisco, may be of interest:

EDITORS PRESS: In my last I said I would give you the facts in reference to the silver ledges recently found in this county.

There is a peculiar mountain about $4\frac{1}{2}$ miles north of Shasta known as Iron Mountain. It has always been regarded as of little value until it should be desired to work it for the iron it contained. But during the last winter a Mr. Sulet, an assayer, had been investigating its merits, and he made the discovery that it contained large amounts of silver as well as iron. Some of the rock has been brought to this city and is being worked. The mountain is about 3,000 feet above the level of the sea, and is somewhat difficult of access, but by a trail from Whiskeytown is comparatively easy of ascent.

The ledges are well defined and of enormous proportions. We approached it first at the discovery claim, where the ledge is easily 150 feet wide and crops out to the height of 1,000 feet. Where the discovery claim is opened it shows a grand mass of iron and silver. Assays of it have been made of very high figures—from \$10 to many hundreds of dollars per ton, so I am told. I have made assays from \$10 to \$115 per ton in silver, and also some gold. I have made no assays of the richest appearing rock. The ledge is plainly visible on the surface for two or three miles, and the belt is all located for four or five miles. Such has been the rush, that prospectors have located everything that had the appearance of anything similar to that rock. There is doubtless a very large and very rich silver deposit here, but to my mind it will be difficult to work on account of the prevalence of iron. The iron is in excessive quantity. Where the discovery ledge or claim is opened there is a curious spring, which flows as from a hydrant, coming out in a beautiful jet or stream 2 or 3 inches in diameter; and in the afternoon of each day, about 2 p. m., it commences to flow far more rapidly and the jet rises from the surface to a height of 4 feet, and thus continues to flow for two or three hours; showing that at its head, or in the mountain, a cavity fills up during the day and night, and, when filled to a certain height, adds additional pressure by the condensing of the air in the cavity, and when it is exhausted the spring flows as usual until a recurrence of the same cause produces the same phenomenon.

There is not a gulch or creek in any of the mountains around this part of the country that has not at an early day paid richly in gold, and some of them have shown some silver. The people now are looking up the sources of the precious metals, and very many rich gold ledges are being discovered.

The Extra Mining Company is the largest producer in the county; next to it is the Dry Creek Tunnel and Fluming Company.

The following mines have reported: Kim & Shea, Niagara, Shafter, Dixon & Cooper, Extra, Church Hill Placer, Centennial, Booth Gravel, Quing Sing & Wong Fuey, Williams, White Gravel, Old Washington,

Vermont, Scorpion & Cold Spring, Brown Bear, and Dry Crup Tunnel and Flume Company. Their production, with \$14,972 gold produced by Chinese, amounted to. gold, \$140,465; silver, \$117,907; total, \$258,362.

SIERRA COUNTY

Is noted for its rich drift mines. The western slope of the county is very broken, being alternately high ridge capped with volcanic matter and gravel, and deep cañons. Many of these gravel deposits have yielded fabulous sums, and there still remain large tracts of land untouched by the miner.

The celebrated Blue Head Channel, which, with its parallel ridges, traverse the county from north to south. The two westerly channels are chiefly hydraulic in their character.

Forest City, Alleghany, Chippis Flat, and Minnesota lie on the Blue Lead. Snow Point is its southern extension in Nevada County. North from Forest City, on the lead, are Ruby Creek, Rock Creek, and City of Six; and, crossing the North Yuba, Monte Christo, Fur Cap, Grizzly, Deadwood, Poker Flat, Cold Canyon, Howland Flat, and Gibsonville. Two to three miles west is what is called the Conglomerate Lead. The Derbec mine and Morris Flat in Nevada County are on it, and, crossing the Middle Yuba, the Golden Star, and the range to the west of Mountain House, it appears from point to point and is traced northward until it loses itself in Plumas County. The extreme western channel, which is all quartz, passes through Camptonville, Brandy City, Scales, and traverses to the north of all Sierra and Plumas Counties. To the east some few miles appears a range which has produced large sums in the past. The Savage, Littypit, One Thousand and One, Gold Lake, and Mohawk lie on this range. The cross mineral-bearing ridges, which appear to be connected with the parallel channels, yield as much as the main deposit.

The value of the mineral deposits of the Blue Lead of this county is \$500 per linear foot; average profit per linear foot, \$220. The Blue Lead and the two western channels contain miles in length of deposits intact, on account of its locators, as a rule, not having the requisite capital to open and develop their respective properties.

The past year has been a prosperous one for the drift and hydraulic mines in Northern Sierra. Attracted by the favorable inducements, capitalists from the leading money centers are seeking investment, as is evidenced by the bonding of many gold mines from the rich leads of La Porte through Gibsonville to Howland Flat, and the valuable hydraulic claims in the region of Morristown.

In the extreme northwestern corner of the county is Gibsonville, which is recovering from the recent fire, which swept off nearly all of its buildings, both business and residence. There are many mines in this part of the county that were supposed to have been worked out, which have been found on further exploration to contain plenty of gold. The Niagara, formerly the North America, at Whisky Diggings, near Gibsonville, has developed a channel running through the ridge to Hopkins Creek. This mine was bought by an English company, who paid for it \$400,000, and then sold it for \$60,000 because they did not make it yield as soon as was anticipated. Since then the new owners have taken out of it an immense sum of money, and they have but lately discovered that they have a large channel, although the mine has been worked for sixteen years.

On the Michigan claim, on which the owners have been at work for

seven years, they are still at work driving the main tunnel, which is some 3,000 feet long, and it is expected to tap the channel in the course of 150 feet.

The Union Consolidated makes the largest report of production from Gibsonville. This company is a drift claim, with a tunnel 2,500 feet long. During the past season it has breasted 1,200 feet at the mouth of the tunnel, and work is still continuing on its main tunnel.

The hydraulic gravel mine of Messrs. Cox & Gourley is an important property. This mine is in good condition for the coming season, employs 40 hands, and uses 3,000 inches of water, working two powerful monitors night and day during the water season. The pressure is 200 feet, and, as the gravel is free, an immense body is washed during a run of 100 days. The company own three water ditches, one of which is four miles long, and they have a large tract of land yet in reserve.

Here is also the Squire's Claim, a drift gravel mine with a tunnel 1,000 feet long, from which the owners are taking gravel worth \$1 to the car load, and there is sufficient water to wash the year round.

Of the many ridges of this part of the county which remain unprospected, that from Gibsonville to La Porte, in Plumas County, is one of the most considerable.

A Chicago company, called the Bald Mountain Consolidated, located at La Porte, has bought up the Gibsonville ridge for a distance of 3 miles. Mr. Hamilton Smith, jr., and others, have bonds on the other five of the eight miles of the ridge.

The Bald Mountain Consolidated are making extensive preparations to develop their property as soon as the snow is off.

The Pliocene Consolidated mine consists of some 6,000 acres of hydraulic mining ground, owned by the Union Investment Company, of New York. This includes the mines at La Porte, Grass Valley, Spanish Flat, Bernard Diggings, Snook's Point, Morristown, and Craig's Flat. They have about 16,000 inches of water, and are running over a dozen monitors, employing 300 men.

Portwine.—Here is located the American hydraulic mine, one of the standard mines of Northern California. It has been most successfully worked for over twenty-eight years, and it will be worked for the next twenty-five years, as it contains 1,300 acres of mining ground yet untouched. This mine has yielded upwards of \$7,000,000. It is the second mine in point of production for the fiscal year in the county.

The Ohio Mining Company has lately made some very favorable developments.

Howland Flat or Table Rock is said to be the liveliest mining camp, except Forest City, at present in Sierra County. All the drift and hydraulic mines are panning out a generous supply of gold in such large quantities that the owners of a number have succeeded in bonding their property for hundreds of thousands of dollars, on a very short time, when they will most likely sell to eastern capitalists, whose intention it will be to develop the vast and comparatively unexplored gravel fields of the north on a larger scale than has ever been attempted since the inauguration of the industry of mining in the mineral beds of the Sierra Nevada.

Returns are made by the Sears Union Water Company here; which is a very prosperous concern. Among the productive mines are the Bonanza and the Virginia—both drift mines—also the Last Chance, a hydraulic claim. The Virginia has been recently bonded to San Francisco parties for \$150,000. It has a tunnel 2,500 feet long, and at its late clean-up the company averaged \$5 to the car load. The ground is very

soft, and the present owners expect very soon to strike much richer gravel. The Bonanza is situated just above the Virginia, and adjoins the celebrated Keystone mine. Work was begun on the tunnel two years ago, and the year's production makes it rank, with the Sears and the Virginia, among the first mines in the county.

The California Gold Mining Company is a newly-developed mine, just beginning to produce.

Two new mines are announced for this locality—the Troxelle and Bruckman—and some two claims are being prospected with various encouragement.

At Saint Louis the Donahue claim is the most important mine in the camp. During the season of water it gives employment to 125 men, a large portion being Chinese. A short distance below the town are some drift gravel claims which are making a good yield. The work in these mines is done chiefly by Chinese. From here we learn that the Gardiner's Point mine is a part of a combination of property developing a productive gravel mine.

At Poker Flat, east of Gibsonville, there is still a large reserve of gold securely hidden in the fastnesses of the mountains.

Carr's hydraulic claim, and the Little Grizzly, are reported as doing very well this season.

The following is from the Mining and Scientific Press, of San Francisco, Cal., of date December 25, 1880:

Among the projected enterprises now being inaugurated is one called the Blue Gravel Consolidated, which consists of four locations, embracing a tract of something over 400 acres. It is on the well-known divide between the headwaters of the North Yuba and Big and Little Canyon Creeks, and covering about two miles of the old river bed or ancient channel, which has been worked on both sides of their claims very successfully for years past.

The claims are about three miles southwesterly from Table Rock or Howland's Flat, and about the same distance northeasterly from the well-known Monte Christo and Tur Cap mines. They are about two miles easterly from Morristown, Craig's Flat, and Eureka North. The claims are entirely in virgin ground, and can be opened at three points, viz, from Reese ravine, Little Canyon Creek, or Saw-mill ravine, either of which are natural outlets for the claims, and all of which were very rich in gold. Saw-mill ravine would be deemed perhaps the most feasible, as the channel could be reached through a tunnel about 1,000 to 1,200 feet long, and at a cost of about \$15,000. Water sufficient to work the gravel is obtainable in Reese ravine and others on the claims the year through, and the tunnel itself would probably afford considerable water for the same purpose. There is an abundance of timber on the claims. The claims can be reached by wagon road over Howland's Flat, five miles distant, and also by trail from La Porte and Port Wine, distant six miles. The way this property is to be opened will show how such enterprises are to be managed. The owners will convey the entire claims to a trustee to hold for a company to be formed by the investors, who are to take charge of the property, construct the tunnel, and such appliances as may be necessary to develop the claim. The company is to have entire charge of their own expenditures, elect their own officers, agents, and employés, and prosecute the work in their own way and at their own expense, but continuously and as expeditiously as possible, consistent with economical management. When the tunnel is completed, claim opened, and pay gravel obtained, the company is to have 250 shares more than one-half of the capital stock—or the controlling interest—and the remainder belongs to the original owner or his assignees. After pay gravel is obtained in the tunnel and the claims properly opened and provided with necessary appliances for drift mining, should the claim not be self-sustaining, and an assessment be required, all the stock or interests are to be assessed alike. This arrangement is necessary for the reason that the owner requires capital to run the tunnel and open the claim. He therefore conveys the property on the condition stated.

In the vicinity of Gold Lake there is a large area of mining ground that is hardly prospected yet, although mining has been going on there for twenty-six years.

The Truckee Blue Gravel Company, located just beyond Woodchuck ravine, have "a tunnel in 550 feet with nice blue gravel that prospects

fairly. Haskel Peak has a tunnel in 500 feet with nice looking quartz gravel. Culver & Co. have a good paying claim in the ravine below Woodchuck. Davis & Wilson have a paying claim just in the edge of Thompson ridge. They have taken out as high as \$300 per week, with very little water. Parties on Little Boulder ravine have done fairly this year, making a great deal more than the expenses. Freeman & Co. sunk a shaft last year, at Big Boulder ravine, 85 feet deep, nearly all through gravel. The Pennsylvania Company, Thompson ridge, are in 1,700 feet through granite and gravel."

Craycroft's diggings, above Eggleston & Moury's, between Middle and North Fork, will be ready to open the spring's mining campaign with the utmost vigor. This is supposed to be one of the richest undeveloped gravel regions in the Sierra.

Downieville.—"The town of Downieville is situated on a quartz belt running north and south—serpentine rock on the west and slate rock on the east. The dividing line between the two is at the lower end of the town on the slate range. Good pay ledges have been found within a mile of the dividing line. Along with these ledges are often found very rich seams and stringers of quartz making into the main ledge.

"On the eastern edge of the serpentine rock some rich quartz mines have been found. Between the serpentine and slate rocks is almost a continuous line of quartz, in some places amounting to a mere seam, in others into wide and extensive ledges mixed in with porphyry and other vein matter. Some of these ledges are what miners term bull ledges, carrying no gold alongside of them, and running parallel will be found the true pay ledges. This quartz belt may account for the extraordinary richness of the old placer diggings right in the town limits and vicinity. Undoubtedly a great deal of the gold came out of the ancient river channels on the top of the mountains, in the cutting down of the streams to their present depth. The regular course of the bed-rock in this vicinity is west of north and east of south, consequently the ledges are the same with their dip, and vary according to the nature of the rock surrounding them."

These quartz ledges have been, comparatively speaking, undeveloped, the mines operated being principally gravel.

A large number of tunnels are being driven into the deep gravel deposited in this the Gold Lake mining district, one of which has found a fair prospect for the distance gone, 1,500 feet, but the main channel cannot be thoroughly tested short of 4,000 feet.

It is thought that some of the gravel deposits were low down before or independent of the gold supply, but the placers have been mixed with the rich out-push beneath; there can be little doubt that a large part of the rounded pebbles and boulders found on the tops of the mountains are independent of water rock. In some cases the outcome has been with much force, in others a slow pushing up of the more yielding gold-bearing material.

The Keystone is second to the Eggleston & Moury among the productive mines in this district.

In the 1001 mine the gravel is improving with development.

In the Good Hope Extension a pay chimney was found on the north end of the claim, which promises to be rich and extensive.

The latest excitement is the striking of some very rich quartz in the Forest Queen mine, near the mouth of Slug Cañon, which had been closed for some years. A new tunnel is now being run 100 feet below the old one, and in it a surprising rich chimney, 3 feet wide, has been found,

with a well-defined wall. The quartz is thick with gold, which can be easily discerned with the naked eye.

Arrangements are being made for erecting a quartz mill which will afford the Oro and adjacent mines an opportunity of prospecting their quartz veins at a comparatively trifling expense.

The principal mining is being done by the Chinese, who are operating mostly on old mines, or on old worked-out ground, who are, as a rule, making but a scanty living. They have produced gold at this place during the fiscal year amounting to \$64,525.

Two miles from Downieville is the Gold Bluff mine, which was worked many years ago. A recent discovery of a good ore ledge 4 feet wide is reported as being very rich.

The Black Jack Mining and Smelting Company, whose property is situated in Jim Crow Cañon, has reorganized in New York with a large working capital, and is making preparation for a heavy production.

From Goodyear's Bar we are informed that the prospects for an increased yield of this locality is exceedingly encouraging. The only mine at this place making any returns is that owned by Mr. H. R. Perry.

Fir Leaf.—But few of the old mines are being worked this season. The chief mines here are on the Baird and the Mugginsville. Three new mines have been opened, of which no definite information has been received. The Chinese are operating here to a considerable extent. The Ah You and the Chapparral are owned by this race. Their production is said to be \$3,120.

Brandy City is surrounded on all sides by large cañons, and receives its supplies on mules and Chinamen. The mining season just closed has been the shortest one for years, which is due to the fact that a snow slide carried away some 1,500 boxes of the Hoosic ditch, from which the mining companies get their water.

The Brandy City Hydraulic mine is the richest in the county. It was located twenty-six years ago, and since that time has yielded millions to its owners. The company has ground enough to last it for many years.

The Arnott claim, about a quarter of a mile east of town, is now making its clear-up. During the season a large area of ground has been washed and the yield has been very satisfactory.

The Bunker Hill Company, four miles to the north, is a drift gravel claim. It is running a bed-rock tunnel, with most excellent prospects.

Scales Diggings lies 7 miles north of Brandy City.

The Cleveland and Turin Company here are making good progress. They give employment to about 50 men during the water season.

The Fairplay Company, in connection with the above, make a very fair showing for the year's work.

The Gold Valley, at Poverty Hill, is a very valuable property, making good returns.

At Forest City the Bald Mountain gravel claim continues its immense yield. Its main tunnel is over a mile and a quarter, with no apparent decrease in the richness of the channel. This ledge was discovered many years ago as the Kate Hardy, and when first worked paid well. Some two years ago it was relocated under the name of Bald Mountain Quartz Company, since which time it has become a steady producer, and is at this time the third most productive mine in the county.

The Bald Mountain Extension Mining Company has expended large sums in running tunnel, but has produced nothing thus far, though there is good evidence of near proximity to a gravel lode whose store of gold is yet an unsolved problem for the future to determine.

The South Fort mine, owing to a lack of funds, is not fairly developed. A tunnel has been run 2,500 feet through good ground and crossed a channel of blue gravel 600 feet wide, but were 40 feet too high at this point to work it to advantage. By sinking shafts it was found to be rich with gold. This mine is bounded on the south and west by the Bald Mountain, on the north and east by the Bald Mountain Extension, and on the south and west by the Masonic and Live Yankee mines, nearly all of which have been rich in gold.

Forest City.—Work is progressing on the Wisconsin and Wisconsin Extension mines, upon which large sums have been expended without meeting with much success.

The Ruby mine is being developed with a good outlook ahead. Considerable prospecting is being done on the ridge between Forest City and Gold Lake, a distance of some 30 miles. There are several hundred claims located within this distance, and active work is in progress upon a large number of them. It is believed that a gravel channel follows the ridge for the whole distance, and will pay whenever opened.

Sierra City.—The Mountain Quartz mine has been lying idle during the year, although it has encouraging prospects awaiting the advent of energy and capital.

Of the many quartz mines that cluster around the Sierra Buttes, the highest and most prominent peak of the county, the Sierra Buttes mine takes the lead, as the richest mine in the county and one of the foremost in the State. It continues the large production reported by Professor Raymond ten years ago. North of this the Haskell Peak mine is reported making some valuable discoveries.

The Phoenix and the Rising Sun are under process of development.

The Eureka Consolidated Gravel mine is not yielding at present. They are running a tunnel for the purpose of further exploring its prospective value.

At Alleghany, in the southern part of the county, the Highland and Masonic is the principal mine.

The Buckeye, in its returns, reports good prospects and ground enough for many years to come.

The Chinese at Alleghany have produced \$12,000.

A strike has been made in the Independent mine on Wolf's Creek, near Chipp's Flat, on the 180-foot level. The ledge is over 4 feet wide, with free gold all through the entire vein.

At Pike City, six miles from Camptonville, there are three new mines reported, viz: Independence, Blue Gravel, and Sunny South. The Grizzly mine, owned by John Terry, makes a very good showing for his mine.

The work of putting the new machinery in the Alaska mine at Pike City is being pushed ahead with great vigor, and it is thought that they will soon commence pumping.

The mines which have reported are: Sierra Buttes, Brandy City, John H. Terry, Martinette, Karch, Indian Queen, Fair Play, Union Consolidated, Lowell, Bald Mountain, McFarland, Sears' Union and Water, Perry, Stahl, Gardner's Point, Beuskerman, California Cave, Eggleston & Mowrey, Swallow, Loring, Hill & Co., Placer, Haven, Richards, Mugginsville, American, Baird, Da Owens, Arnott, Indian Queen, Michigan, Keystone, Grizzly, Bonanza, Gold, Doherty, Brandy, Henry Frontell, Habers & Limperick, Scott, Lewis, American Hill, Cleveland and Sierra, Gold Valley, Ah You, Chapparal, N. Y. Gravel, Virginia, Mammoth, Buckeye, Highland and Masonic, Limperick, Atwood, Woodchuck and Buckman & Co. Their production, with \$76,525 gold reported as

produced by Chinese, amounted to, gold, \$974,332; silver, \$576; total \$974,908.

SISKIYOU COUNTY.

Its mines are mainly in the western part, in the Valley of Scott's River, between the Salmon and Scott's Mountain, and along the North Fork of the Salmon River.

The Black Bear Quartz mine at Black Bear is the largest producer in the county, and is one among the first in the State. The Star of the West is a new mine just beginning to become a large producer. In the Evening Star a good ledge of valuable ore has been struck.

Rich quartz is reported at Six Mile Creek, near the Black Bear mine, in various new prospects.

The Klamath Quartz mine, at Klamath Mills, is the second producing mine in the county. Three miles from here is the Uncle Sam, on which a mill is now building.

Near Callahan's, and nine miles from Sawyer's Bar, the Last Chance has struck a rich body of gravel recently. This mine is in Niggerville Gulch, where it is reported a rich quartz vein has been discovered. The Montezuma is the leading mine here and is the third producing mine in the county. The Chinese at Callahan's produced in gold \$40,000.

At Oro Fino prospects are reported as being much more favorable than ever before. There are no new mines reported, but there appears to be a strong determination to invest in well-known mines that are deep, and that could not be made to pay under the old style of working, but are now considered the best property in the county. Many improvements are being made in many of the old mines, and the output from this place will show a great increase during the present fiscal year.

At Fort Jones the abandoned mines are undergoing a process of development, but no new mines are reported.

The Cameron, which sends returns for half of the year, reports the mine under water during the other half.

The Thompson mine is being worked with encouraging success.

We have returns here also of the Oak Grove, Selzs Claim, Cameron, Mathewson, and Hi Yu Gulch mines. The Chinese at this place produced in gold \$21,880.

At Yreka the Empire Quartz mine, which made a report of a small run, is not now in operation. A rich quartz ledge has been opened near here, at Indian Creek, in Grizzly Gulch, just above placer mines, which used to pay \$100 per day to the man.

The Pacific, which sends a report of its production, says its prospects are daily improving. The Chinese produced at this place \$70,000 in gold.

New mines are reported on the lower end of McAdam's Creek; they are the Smith, Swain, and the Steamboat. In the latter mine a shaft is being sunk to the depth of 100 feet to reach bed-rock, when success will be assured.

From Etna returns have been made from the Johnson Quartz and the Boulder Creek Quartz mines, the latter being under process of development, with most encouraging prospects. The Chinese production at Etna is \$5,440 in gold.

At Sawyer's Bar the Chinese produced, in gold, \$2,000.

The mines which have made reports are, Self Claim Company, Empire Quartz, Oak Grove, Black Bear, Klamath Quartz, Lindeley Quartz, Johnson Quartz, Boulder Creek, Star of the West, Young J. W., Last Chance, Messner & Co, Montezuma, Cameron, Mathewson, Hi Yu

Gulch, Pacific, Pierson & McMahon, and Kuskenbout & Meyer. Their production, with \$139,320 gold produced by Chinese, amounted to, gold, \$440,735; silver, \$95,340; total, \$536,075.

TULARE COUNTY.

Its mineral wealth lies in the numerous igneous, aqueous, and metamorphic rock masses of the High Sierras near the border line of Inyo County. Although gold, silver, and lead are known to exist in large quantities, the great altitude of the ledges and the severity of the winter climate has hitherto combined to defeat their proper development.

The town of Mineral King lies at the altitude of 7,500 feet above the sea level. Added to the drawbacks to mining above mentioned, uncertainty has existed as to the free milling qualities of the ore.

Within the past year the Empire Gold and Silver Mine and Mill Company has made strenuous efforts to place the mining interests of the district upon a secure basis.

By the erection of the Hallidie wire ropeway the mill at Mineral King receives the ores of the Empire mine, which is 2,000 feet above it and over a mile distant, at a cost of only 20 cents per ton. This affords every facility for opening the larger bodies of rich ore lately reported in this mine. But the question of vital importance to Mineral King has likely been decided by the test of its ores lately made by the Empire mill. An experimental run of less than three days was made to decide whether it would pay to run the mill without previous treatment of the ore. After a careful clean-up and reduction of the amalgam obtained the result was a silver brick of 1,261.17 troy ounces. As much lead remained, and as only some 38 per cent. of the silver ore had been extracted by the milling process, it was decided that the ores should be roasted before milling. A roaster is now being erected, and the very valuable ledges of this interesting region will find full development.

The New England Smelting Works, at Mineral King, are not now working. The ores are of the zinc-blende variety. There have been no new discoveries made here within the past three years.

We have reports from White Pine that the Biggs and the Garrison mines are being developed with encouraging success. One new mine has been discovered here; a tunnel run into it about 150 feet shows a lead from 6 inches to 2 feet wide, which assays \$40 per ton. There are four quartz mills here.

The new discoveries of the county are the following:

At Smiday Peak, about 40 miles south of Miner's Peak, in the same range, ledges of free gold and sulphurets have been located at its base.

In Deer Canyon, northwest of Mineral King, the Double Standard has been located. This district is also in the highest cluster of mountains in the United States. The vein is a contact fissure between trachyte and dolomite. This region offers much encouragement to the miner.

But two mines have reported, the production of which was: Gold, \$1,125; silver, \$526; total, \$1,651.

TUOLUMNE COUNTY

Is one of the oldest in the State, as well as one of the most prosperous, but its most accessible placers have been well worked out, and as the banks of the hydraulic gravel and the quartz ledges of its mountain ranges are expensive and difficult of development, its prosperity has been for some time retarded. The mining outlook is now however

brightening, outside capital is seeking investment, and the quartz interest especially is now assuming such shape that a system of operations of a larger and more extensive scale promises to restore the early reputation of the county. Its mines are chiefly confined to its western half—the placers of Tuolumne and Stanislaus Rivers, with their tributary streams, and the quartz ledges of the Table Mountains.

The district now making the largest production is that tributary to the town of Sonora.

The Bonanza, owned by Messrs. Dival & Co., has been the chief producer in the county. It has lately been obliged to overcome an accession of water by the erection of a steam pump. The owners are now engaged in sinking a shaft for the systematic exploration of their ground. The large yield of this company has been exclusively from heavy gold in a free state, found in a narrow vein of decomposed slate in a formation of talcose slate.

Running at right angles and in contact with the mine, is the Sonora, one of the locations now opening by Eastern capital—a New York company—which is making every effort to develop it.

The Justice, south of Sonora, has been purchased by an Eastern company, but it has never been prospected to any depth.

In the Evans a rich strike of rock was made at 42 feet in depth, in the south shaft, where a rich feeder enters the shaft from the foot-wall side. If the ore continues as rich as expected, the new chute which the shaft exposes may rival any former developments in this property.

The Kitty is still running on good rock. A small diamond drill will be put to work immediately, to be run by the air-compressor now in place.

The Louisiana has just commenced to run its 8-stamp mill recently erected.

New mines at Sonora are the Hazel Dell, Hornet, Hazel Dell South, and Mastodon—the last with brilliant prospects.

The buyers of gold dust in Sonora report a marked increase of their purchases this year over any previous year since 1870. In the vicinity of Columbia many fine discoveries have been made during the past year. American Camp District is one of the earliest organized districts in the county, and in early times its placers yielded immense profits to the hundreds of men at work here. As elsewhere in this county, it is only recently that attention has been given to the development of its many quartz veins that traverse the State belt within the limits of the district. The ores generally are of a rebellious character, though very rich in gold and silver, or combined gold. The veins carry more or less base metals, lead, zinc, &c., which necessitates the employment of expensive machinery for the reduction and for the separation of the ores. In this district, north of Columbia and between the forks of the Stanislaus River, Mr. Le Roy Reed has made a rich strike in quartz—opening a pocket containing \$8,200 just under the grass roots. The lode is supposed to be an extension of the Levy mine at Wet Gulch. Mr. George Blummer has also made a new and most valuable discovery in the same vicinity.

A new mine here, the Continental, is driving a tunnel, and will reduce no ores until it is complete. The vein is a very extensive one and its ore assays \$18 per ton.

The Riverside quartz is also running a tunnel to open out a depth of mine to 1,000 feet.

Six miles east of Columbia Mr. Osgood found rich float rock, which led to the discovery of the Osgood & Stayton lode, and a number of

other paying claims in the neighborhood. The prospect shaft, at a depth of 50 feet, shows the vein to be 4 feet wide, with regular walls, and in a slate formation. This vein, by the test already made, is one of the best milling veins in the county; the gold being equally disseminated through the ore in every part of the vein.

The Osgood & Stayton Extension Company has uncovered the vein for several hundred feet, and is now driving a tunnel, in which good bodies of milling ore have been found in a regular vein, which is of good size.

Since the discovery of the vein a number of parallel veins have been found in the same locality; they are advantageously situated as regards timber and water, which can be had at a trifling expense.

The Boss, a pocket mine, is being worked with most satisfactory results.

The Magalia, Forest Queen, Forest Gold, and Grey Eagle, are working with encouragement; the last two being new mines.

The Chinese, at Columbia, produced \$35,000 in gold.

At Soulsbyville, the Soulsby gold mine has this year struck a fine body of high-grade ore. This mine has been a producer for the past twenty-three years, having its ups and downs, but this last find in one of its drifts has put new life into its organization.

A rich chute has been discovered in the old abandoned claim known as the True Blue, which is now being worked with renewed vigor. Here the new Williams process is reported to be a perfect success and bids fair to make a revolution in the treatment of rebellious ores.

Near Jamestown numbers of mines are opening, situated on the same mother lode as the Quartz Mountain, Jamestown, Ohio, and other mines, all with encouraging prospects. The Chinese produced at this place \$15,925.

Near Groveland, in Deer Flat, is the Bletcher Consolidated mine, one of the early-discovered mines of the county and district, which is very promising by its present showing, having a vein of good milling ore averaging 5 feet wide and confined within slate walls. We have no returns for its production.

The works of the Mount Jefferson mine have lain idle for some time, but the machinery is now fitting and the mill will soon run with a good force of labor. It will have a 10-stamp mill, steam power, and all the latest improvements for the reduction and separation of ores—also chlorination works on a small scale. About one-half a mile east from Groveland Messrs. Richards & Hunter have a claim that is paying well, and are getting out rich hand-mortar rock. The rock pays from \$5 to \$70 per pound, which is taken from a small streak on the foot-wall side of the main vein, which is from 6 inches to 2½ feet wide. The chute is 120 feet long, and they have taken out \$5,000 on one end and about the same amount on the other end of said 120 feet. The Sonora mine is situated inside of the town limits, and carries a very fine lode, averaging 3 feet in width and nearly vertical; it contains enough free gold to warrant its yielding \$10 to \$15 per ton. Every shift sends up gold in the rock visible to the eye. But the main feature of this mine is the exceedingly rich sulphurets, which assay from \$500 to \$1,000 per ton, of which at present we should judge there are about 5 per cent. and steadily increasing in quantity as they go down.

At Big Oak Flats the Mohrman quartz mine is opening some very rich ore, but has as yet no mill.

The Old Tuolumne Company's future prospects are said to be most flattering. Our returns from this place are of many very small mines. The Chinese produced \$6,000 in gold.

New quartz veins are reported in the vicinity of Bronson and Stevens Ferry.

The Confidence mine is reported as paying well and as being worked most industriously; we have, however, no returns from this mine, or from the Chapparral on Buchanan's Ridge, where a rich strike has been reported this season.

Five miles west of the Tuolumne River, near the boundary line of the county, is the Olsen Quartz mine, at Golden City, in which there is cause, upon the fullest investigation, to believe that there exists a mammoth quartz lode of many miles in extent, in which are found occurring virgin silver in strings or threads. The color of the ore is gray, having more or less copper and galena, though yielding the greater percentage in gold. A 15-stamp mill, with capacity for ten additional stamps, is now being built on the Tuolumne River, $4\frac{1}{2}$ miles from this mine. The contract for a road from the mine to the mill has been awarded, and the mine is being placed in condition for stoping.

At Tuttletown sulphuret works are being constructed at the Waters mine. The lode carries 15 per cent. of sulphurets right along, which yield from \$75 to \$100 per ton. The 10-stamp mill crushes on an average 19 tons of ore every twenty-four hours.

At Chinese Camp, on Wood's Creek, a branch of the Tuolumne River, a large body of Chinese are engaged in mining, and have produced within the fiscal year \$25,000 in gold.

The following mines have reported: Quartz Mountain, Soulsby Gold, Portland, Tyger, Hawes Gold, Hennessey, Yancy Kily, Golden Gate, Stewart Placer, New Albany, Stuart & Co., Cracker, Philadelphia, Riverside Quartz, Grey Eagle, Holmes & Miller, Evans, Bonanza, Beals, and 12 small mines. Their production, with \$82,475 gold produced by Chinese, amounted to gold, \$461,861; silver, \$1,071; total \$462,932.

TRINITY COUNTY.

Its placer mines have been worked for a number of years with great profit. Recently the extensive deposits of deep auriferous gravel have been attacked by the most approved system of hydraulic washing, and there are in this county along the Trinity and its branches a number of localities that afford the very best inducements to parties having the requisite means to engage in this branch of mining.

Although several new claims have been put in active operation by the enterprise and capital of San Francisco companies, the county suffers under a peculiar state of affairs; much of its most promising territory is in the hands of miners of insufficient capital to avail themselves of competent water facilities, and much is the property of men whose riches and enterprise is diverted to the carrying out of other undertakings. This is the case with a large estate lying adjacent to the town of Trinity Centre. On it the conditions for prosecuting hydraulic mining are most excellent. Timber and water are abundant, while the material with which to operate is present in endless quantity and of seemingly good grade. Thousands of acres of these gold-bearing gravel lands have been aggregated into one estate, and portions of it patented. Many improvements have been made, but the business rests there, and the enterprise is abandoned for what the owner feels more imperative business.

At Coffee Creek, near Trinity Centre, the Nash Deep Gravel Company have begun extensive operations on a large body of land well supplied with water. No new mines are reported, and there are no mills or

smelters here. We have returns from two mines at this place—the Shoo Fly Placer and the Morrison Gulch.

From Lewiston, in Deadwood District, we have the following information: the ores are of a good-paying quartz, but capital is very much required to work the mines at a lower level. There are here five arastras but no mills.

The Buckeye Water and Hydraulic Company are making extensive developments, and have completed the longest ditch in the county. It reaches to Stewart Fork, and connects with the water on Owens Creek, which gives this company a supply of water, enabling it to work all the year round.

Rich quartz has been struck on the Monte Christo, which has somewhat excited the community. The Brown Bear and the Montezuma Mining Companies have water only in the winter and spring. The Black Bear is the largest producer in this district, in which the producing mines are Klein, Brown Bear, Montezuma, Buckeye Water and Hydraulic, and Denier.

At Weaverville the Homer reports its yield as less than half as much as usual. The Garden Gulch has only been partially worked for want of water. The mines of McMurray & Happ continue to yield largely, but we have no returns from them. The Chinese are industriously at work in the placers of this locality. They have produced in gold \$150,000. The producing mines at Weaverville are the Weaver Creek Milling and Mining, Weaverville Ditch and Hydraulic, Rule, Harvey, Holmer, Garden Gulch; and of these the Rule and the Harvey take the lead.

At Big Bar a revival of mining industry is expected through the season through the efforts of some old and experienced miners.

The Wilshire Hydraulic Mining Company, which has been recently organized, intend to work their ground thoroughly. The Vance's Bar Placer mine is becoming a large producer by means of their improvements just completed. The Skunk Point mine, which has lain idle for several years, will be worked by Timothy Hall, who is putting a giant in it with water from Thompson's ditch. The Chinese produced at this place \$3,000 in gold.

At Taylor Flat, on the Lower Trinity, is located the Trinity Hydraulic mine, which did not commence operations until June, and consequently have no report to make for the fiscal year. The mine is in excellent condition, and bids fair to become one of the most valuable in the State.

The mines in the northwest part of the county, along New River are now attracting much attention. New River, which is a branch of the Trinity, is a good-sized stream, and the mines have been worked as far back as 1852. Here was at one time a giant, but now abandoned.

The enterprise of the New River Hydraulic Mining Company at Cedar Flat is now attracting special notice. They are building a flume and a ditch with which to convey the water on to Hawkin's Bar. There is a considerable amount of gold produced along New River by private individuals, for which no means are at hand for ascertaining a correct statement of the total. There are also a number of Chinese working along the banks of this river with supposed good success.

At Burnt Ranch, along New River, a Portuguese company own the famous Rattlesnake Bar, a tract of 160 acres, which they are working in a very crude way, but make it pay very handsomely. A recent clean-up of a part of their ground, which was sluiced by them last winter, favors the opinion that they have made a rich strike. This company is the largest producer in the county.

From Douglas City we learn that, owing to an accident which caused the reservoir to give way and the banks to cave in, the Johnson mine had done but little work and had made no clean-up, but that the prospects of this mine were very flattering.

At Junction City, no new mines are reported. Here there is plenty of placer ground, but a scarcity of water to work it.

At Red Hill and at Cox's Bar mining is progressing satisfactorily.

On the eastern verge of the county rises the mountain of Bully Choop, partly in Trinity and partly in Shasta Counties. The district of Bully Choop extends into both counties.

The most valuable of these quartz-bearing ledges are in Trinity County, but owing to the long winter season, and the difficulty of getting machinery into the district, they have never been fully developed. The entire hill is a network of ledges cropping above the surface, others capped over with porphyry. We have no returns whatever from the Bully Choop mines of this county.

The mines which have reported are: Klein Quartz, Brown Bear Quartz, Price, Weaver Crook Milling, Rule, Harvey, Weaverville Ditch and Hydraulic, Pickel, Dannenbrink, Morrison Gulch, Shoo Fly Placer, Lorenz, Rule, McKinney, Lyons Junkans and Scheffer, Montezuma, Buckeye Water and Hydraulic, Denier, Black Bear, Holman, Portuguese, Keno, Johnson, Sheridan, Indian Creek, and Vance's Bar. The production of these mines, with \$153,000 produced by Chinese, amounted to \$326,693 gold; silver, \$142; total \$326,835.

YUBA COUNTY.

Although the quartz ledges of this county have been worked with some success, and many recent developments have been made in them, the yield continues to come chiefly from its placer mines.

At Smartsville the Excelsior Water and Mining Company, is, as when Mr. Raymond made his last report, the leading mine of the county and one of the most extensive hydraulic mining enterprises in the State. It controls the greater portion of gravel in the district, and the chief supply of water is through its ditches. This company used in the year ending March, 1880, 418,022 inches of water.

The Nevada Reservoir Ditch Company is the next most productive mine in the county. It used in the same period 89,194 inches of water. These two are the only mines reporting production, and they likely include in their output the entire yield of the district, except that of the Chinese which is \$16,000 in gold.

The Forlorn Hope Gold Quartz mine has been developing for the past two years. It has as yet produced no bullion, but the mine at this time looks well, and the owners expect a good yield.

In the camps adjacent to Camptonville are the following mines which have made returns of production: Arnot Reed & Co., Brush Creek, Williams, Oshawa, Stevens, Weed's Point, Humphrey, and Joubert & Terry. The Arnot, Reed & Co. ranks with the Nevada Reservoir Ditch Company in its production. The Chinese at this place produced \$60,000 in gold.

A silver ledge is reported to have been found at Oak Valley, about 4 miles from Camptonville, where Messrs. Biler & McBride, in prospecting a ledge for gold, found some singular-looking metal in large quantities, which, when tested, proved to be strongly impregnated with silver. The ledge has been traced 4,000 feet, and the vein is 14 feet in width.

At Oregon House a good many new ledges are reported. The Templar mill and mine has opened with fine prospects. The Harcourt and the Henry Paine are new mines of much promise.

The Little Bonanza mine is a very rich property. A pocket in it was recently opened which yielded \$1,900. They are still sinking the main shaft, and are drifting for pockets, of which this mine contains many at regular intervals. Through the shaft sunk for pockets they unexpectedly found continuous ledges of gold-bearing quartz.

From Bullard's Bar we learn that there have been no new mines opened during the past year, and that there are no mills or smelters in the district. We have returns from the Baxter, Pepper, Mill Creek, Watson, Kester & Co., and Bridge's Creek. The last mine is now working again after repairing ditches and reservoir. The Pepper is an individual placer claim worked by hydraulic process.

At Strawberry Valley are the following mines reporting production: Boyer & Son, Buckner & Co., Iowa, and the McNish.

At Brownsville a new claim, opened by Messrs. Safford & Hedges, promises well. The mines here are the McChesney, Union, Indian Ranch, Florence, Gaitly Flat, and the Washington Mill and Mining Company.

At Wheatland the Chinese have yielded \$400 in gold.

A revival of mining industry is reported at Brown's Valley. The Solo Mill and Mine are sinking inclines and working a gold-bearing quartz ledge on an old abandoned claim with excellent success thus far. They have recently erected a 10-stamp mill, which is now running day and night. In each of their three levels a well-defined ledge, varying in thickness and richness, can be seen, and on the lowest level it is not less than 20 to 30 feet, but of a poor quality.

Developments are being prosecuted on many claims in this neighborhood.

Several ledges on Sly Creek are being prospected, and large quartz developments are reported from Ranch Section, 17 miles from Marysville.

The following mines have reported, viz: Boyce & Bro., Iowa, McChesney, Union, Brush Creek, Arnot Reed & Co., Williams, Excelsior Water, S. C. Long, South Feather Water, Baxter, Pepper, Nevada Reservoir Ditch, Buckner & Co., Templer Mill, Eagle Mill, Indian Ranch, Florence, Gaitly Flat, Oshawee, Stevens, Weed's Point, Humphrey, Joubert, Washington Mill and Mining, Safford & Hedges, Terry, Mill Creek, Watson Keslin & Co., Bridge's Creek, and McNish. Their production, with \$76,400 gold produced by Chinese, amounted to: Gold, \$943,860; silver, \$438; total, \$944,298.

Summary of bullion production of California by counties, as reported by mines.

County.	Gold.	Silver.	Total.
Alpine	\$17, 113	\$24, 146	\$41, 259
Amador	1, 495, 053	1, 953	1, 497, 006
Butte	430, 501	1, 247	431, 748
Calaveras	320, 865	643	321, 508
Colusa	4, 830	78	4, 908
Del Norte	215, 403	300	215, 703
El Dorado	389, 383	208	389, 591
Fresno	143, 433	.....	143, 433
Humboldt	153, 940	80	154, 020
Inyo	48, 648	173, 916	222, 564
Kern	94, 214	390	94, 604
Lassen	25, 000	.....	25, 000
Los Angeles	7, 700	66, 300	74, 000
Mariposa	150, 017	1, 300	151, 317
Mendocino	733	125	858
Merced	17, 515	.....	17, 515

Summary of bullion production of California by counties, &c.—Continued.

County.	Gold.	Silver.	Total.
Modoc	\$10,000	.....	\$10,000
Mono	2,407,236	\$582,905	2,990,141
Nevada	2,702,362	70,144	2,772,506
Placer	838,133	640	838,773
Plumas	857,124	181	857,305
Sacramento	342,514	.....	342,514
San Diego	81,558	.....	81,558
Shasta	140,455	117,907	258,362
Sierra	974,332	576	974,908
Stanislaus	73,271	.....	73,271
Siskiyou	440,735	95,340	536,075
Tulare	1,125	526	1,651
Tuolumne	461,861	1,071	462,932
Tehama	1,500	.....	1,500
Trinity	326,693	142	326,835
Ventura	354	.....	354
Yuba	943,860	438	944,298
Unreported sources	14,118,361	1,140,556	15,258,917
Total	1,500,000	.....	1,500,000
Total	15,618,361	1,140,556	16,758,917

Statement of the bullion production of some of the mines of California, prepared at the Mint Bureau, from tables published by the Mining Record, of New York.

Mine.	January 1 to December 31, 1879.	January 1 to June 30, 1880.	Fiscal year 1880.*	Calendar year 1880.
Bodie Consolidated	\$785,168	\$192,534	\$585,118	\$435,980
Black Bear	151,200	82,000	157,600	129,400
Bulwer Consolidated .....	.....	65,200	65,200	101,736
Blue Tent Gravel .....	.....	.....	.....	25,000
Belvidere .....	.....	.....	.....	25,960
Bechtel	11,300	.....	5,750	.....
Bulwer	242,494	.....	121,247	.....
Coso (new)	72,608	5,000	41,304	5,000
Dudley .....	.....	.....	.....	1,746
Dardanelles	14,700	.....	7,350	.....
Excelsior Water and Gravel Mining Company	332,400	110,000	276,200	111,000
Empire, Amador County .....	.....	245,704	245,704	481,000
Fresno Enterprise	28,100	87,523	101,573	102,086
Godfrey Gravel .....	.....	7,500	7,500	7,500
Green Mountain .....	.....	52,508	52,508	159,313
Gold Stripe .....	.....	.....	.....	42,294
Idaho, Grass Valley	451,500	150,300	376,050	392,160
Independence Hill .....	.....	17,500	17,500	17,500
Ivaupah and Yosemite .....	.....	20,258	20,258	35,558
Klamath Quartz Mining Company	35,400	.....	17,700	.....
Keystone, Amador County	182,860	.....	91,430	.....
La Grange Hydraulic	80,900	.....	40,450	.....
Mammoth, Mono County	51,400	7,400	33,100	7,400
Milton Water and Gravel	584,000	.....	292,000	348,788
Murchie	68,300	.....	34,150	.....
North Bloomfield Gravel Mining Company	316,900	71,800	230,250	275,776
Noonday Mining Company .....	.....	97,304	97,304	175,699
North Noonday .....	.....	156,397	156,397	293,385
Noonday	24,700	.....	12,350	.....
Oneida	21,400	58,471	69,171	108,048
Original Amador	28,500	.....	28,500	.....
Plumas Eureka	162,750	85,000	247,750	227,031
Pittsburg, Nevada County	26,300	3,200	29,500	3,200
Plumas Water and Mining Company .....	.....	.....	.....	5,592
Rising Sun .....	.....	.....	.....	50,000
Spring Valley Hydraulic .....	.....	.....	.....	74,500
Sierra Buttes	181,104	.....	95,552	83,295
Standard, Bodie County	1,416,456	758,576	1,466,854	1,614,109
Syndicate, Mono County	12,300	.....	6,150	24,800
Stewart, Sutter Creek	2,800	.....	1,400	.....
Vulcan, Mono County	14,200	.....	7,100	.....
Wyoming Consolidated .....	.....	13,662	13,662	13,662
Total	5,527,590	2,287,837	5,051,632	5,378,518

*Adding column 2 and half of column 1.

NEVADA.

The production of this State is still diminishing, especially in the mines of the Comstock lode. The silver production, however, in the eastern portion of the State, has increased as will be found on examination of the tabulated statements presented. I have estimated the production of Nevada for the fiscal year at \$4,800,000 gold, and \$10,900,000 silver.

The decrease in bullion production of the State of Nevada, which has for some years been at the head of the list of bullion producers, is due mainly to the falling off in yield of the Comstock. Since such great depths have been attained, the cost of mining has greatly increased, and several owners have ceased attempting to do more than prospect at lowest depths.

The great Bonanza mines, as they are called, found no extensive or rich bodies of ore in 1880, although great hopes were entertained that such bodies would be found. Vigorous prospecting has been carried on, however, not only in these two mines, but in the other more prominent ones in the lode.

The California and Consolidated Virginia mines, known as the Bonanza mines, are still producing, between them, about \$3,000,000 a year, but the great cost prevents their paying any dividends or any profits at all.

The great need of Nevada at present is a means of working low grade ores. There are thousands of tons of such ores all over the State, and more particularly on the Comstock, but by processes at present known it is impossible to work them at a profit. They contain, however, sufficient metal for a profit if worked at a low price.

The extent of territory within the Nevada border, nearly all of which is mineral-bearing, precludes the possibility of mentioning the various districts. The Comstock and Eureka are the two principal ones. There are a hundred or more others, many of them with good mines.

The great drawback to mining in Nevada is the expense under which it is necessarily carried on. Miners' wages are high, transportation is expensive, fuel costs a good deal, and it takes a very good mine to show any profit when all the expenses are paid. As the country is gradually opened, however, and people live on a more economical basis, many mines now comparatively valueless will be worked at a profit.

During the latter part of 1880 many men left this State for Idaho and New Mexico, and newer camps where less prospecting had been done. Nevada, however, is by no means "played out" as a mining State. It holds third place as a bullion producer, and a "bonanza" in the Comstock, which may be discovered at any time by any of the various prospecting operations at low levels, would bring it yet higher in the ranks. Numbers of good mines in the State are being worked at a profit by private companies, but many of the more prominent mines have been more or less injured in reputation by influences which relate more to the stock market than to legitimate mining. Those who stick to them and work them legitimately, and for the profit to be taken from them rather than to any derived from stock sales, will doubtless meet with just reward for their labor.

ELKO COUNTY.

The chief mining districts at the present time are situated in the northwestern part of this county in the Red Mountains. The districts

of Tuscarora and Cornucopia are taking the lead with prospects of continued success. Fine prospects are reported in the Page and Kelly and the Amazon.

Mr. Watson, the superintendent of the Columbia Consolidated, reports two new mines, the Maggie, from which 50 tons of ore have been taken, and the Bonanza, opened and showing paying quartz.

In Mineral Hill district, in the southwest corner of the county, work is progressing steadily on the mines, with moderate yield of rich ore.

The Belle Isle still continues to be the heaviest yielder in the county, and the Grand Prize, Independence, Leopard, and Argenta are also heavy producers.

The mines which have reported are: Columbia, Leopold, Independence, Belle Isle, Navejo, Grand Prize, Tiger, Grochen & French, and Hong Lee Co. Their production was gold, \$68,538; silver, \$885,184; total, \$953,722.

ESMERALDA COUNTY.

Of all the mining regions in the State, this and Storey County have yielded returns most in proportion to the miner's hopes. From Aurora district alone has been shipped an amount of bullion second only to the Comstock production. Lying as it does on the northern boundary of Mono County, California, Esmeralda County presents an equally interesting field. In the southern part of the county the separation of the mining camps by an intervening country barren and often utterly desert, together with the difficulty and cost of transportation, has prevented the development of some of its most promising claims.

It is now expected that the narrow-gauge railroad will be extended from Dayton, on Carson River, in Lyon County, to the south end of Walker Lake, and thence to Aurora and Bodie. This will give an outlet to the mines of Esmeralda and the adjoining counties of Nevada and California.

Columbus district, in nearly the center of the county, lies on the edge of the Great Salt Basin. It includes the Candalaria, Belleville, and Metallic City mines. The mines of this district are confined mainly to one great mineral zone nearly 10 miles in length, with an average of a half a mile in width; the underlying ore veins taking a dip to the north.

Formation, a porphyritic clay slate, in places more or less silicified, and grading off into quartzite.

The Northern Belle, the most productive and most prominent mine in the county, continues to produce in large and paying quantities, and there is every reasonable prospect of the yield holding out for many years to come. This company does the principal milling for the district.

The Enterprise Mill and Manufacturing Company have produced nothing this season, being engaged in running a tunnel, with good prospects ahead.

The Mount Diablo mine, above Metallic City and a mile from Candalaria, has been making recent developments which promise to restore its reputation of several years ago as a producer, which is at the present writing being realized.

The Victor, including the Magnet and Chloride, is looked upon as a promising mine. The Mount Potosi mine, on the western slope of Mount Potosi, reports their output good, but no clean-up has been made.

Other mines of this district, promising well at last reports, are the East Mount Diablo, General Jackson, Lucky Hill, Equator, Metallic, Southern Nevada, Belding, Holmes, Malloy, Candalaria No. 2, Mountain

Girl, Wonder, Saratoga, Eastern Belle, New England, Highland Chief, and Tilden.

South and east of Columbus district, in the triangle forming the southern part of the county, there are many mining districts hitherto little known, as here the miner has worked against many disadvantages. Separated from the thoroughfares and centers of supply by great wastes of desert land, the isolation and the difficulties of the situation have deterred even the bravest efforts from opening the most prominent claims.

The great and extended mineral wealth of this part of the county is fairly proved, and when facilities for reducing the great quantity of low grade ores shall be reached, and nearer railroad communication completed, the many districts now clung to so tenaciously by present occupants will have a fair show of development.

Silver Peak district lies about 50 miles south of Columbus, on the border of an immense salt marsh. The ore here is rich and much of it easy of reduction, but the mills are generally idle. The Silver Peak Company will resume operations at an early date.

In Montezuma district, to the east, the presence of a good supply of wood offers encouragement. The district is now much in need of improved smelters to reduce the ores so heavily leaded as largely to defy the process of milling.

South of Montezuma and on the spurs of the mountains on the eastern border of the county is the district of Lida Valley. Messrs. Appleby & Co., of the Commissary Mining Company, which has been located but a few months, with favorable prospects, give the following interesting information:

Lida Valley district is situated on a mineral belt of about 12 miles long and a mile wide. It is well supplied with wood and water, and the climate is good. Mining has been carried on here for some eight or nine years, and some rich deposits found in and about Lida Valley. These mines have not been prospected to any great depth owing to their isolated position. The camp is over 200 miles from a railroad, and transportation is very expensive. No new mines are known to have been opened, but a number of shafts are being sunk on good prospects. There are two small mills in the camp.

Twenty miles south of Lida Valley is Gold Mountain district, where mining prospects are said to be most excellent. Here are the Oriental, Rattlesnake, and State Line mines.

² Benton district, situated principally in Mono County, California, includes also the mines on the State line, and in the camps between it and Columbus.

Aurora district.—Important developments in this district are the Prospectus, by Governor Blasdel, the Grand Trunk, Centennial, Esmeralda, Rothschilds, Quincy, and Thanksgiving—the latter sending small returns of ore worked only to test the mine from 300 tons on dump. Owing to a heavy influx of water, necessitating the erection of heavy pumping machinery, no ore was reduced by Real Del Monte mine during 1879.

The most active mining operations in northern Esmeralda are now clustering in the district of Cambridge. The mines are easily worked, and their ores transported to the reduction mill. Governor Blasdel has bought up many of the old mines, and has erected a new mill.

Work has been resumed in the old Dolores mill, in the Rockland district.

Three miles north of Rockland, in Pine Grove district, some work is being done of a spasmodic nature.

A new mining district has been formed out of part of the old Mount

Grant district, and the country bordering on the southwest portion of Walter's Lake. Here a rich ledge is reported to have been struck in the Big Inyon mine very recently which has created some little excitement in the district.

The prominent producing mines of the county for the fiscal year are, the Northern Belle, Wason Consolidated, Wilson, and Indian Queen.

The mines which have reported are: Silver Peak Mill, Buenly, Wilson, Mount Diablo Mill, Endowment, Northern Belle, Wason Consolidated, Indian Queen, Thanksgiving, Lida Valley Mill. Their production amounted to, gold, \$953; silver, \$1,282,800; total, \$1,283,753.

EUREKA COUNTY.

At Cortez, in the northeastern part of the county, and at Eureka, in the southwestern, are the chief mining camps of this county.

In Cortez District is the Garrison mine, one of the heaviest producers in the county.

In Eureka District are the famous Eureka Consolidated and the Richmond Mill and mine. There are returns from eight mines of this district, besides the Eureka and the Richmond, the Silver Connor, Bay State, Connolly, El Dorado No. 2, Dug Out, Irish Ambassador, Silver Lick, and Ruby Dunderberg. The last seven mines sell their ores to the Richmond Mill, and the result is included in its reported production.

The Zula mine is again producing, and an important strike has been recently made in it.

Mr. Morris H. Joseph, superintendent of the Central Hill, Salamander, Sala, and Twin Arrow mines, says of these claims that they are marked on the surface by several ribs of quartz veins of silver-bearing and galena ores from 1 to 6 inches thick, none of which have been followed to a depth of over 20 feet, although assays run from \$134 to \$2,000 of picked rock. Progress on these mines has been slow, owing to the hardness of the rock and the lack of sufficient capital. No ore has as yet been shipped from these mines, but prospects are good for shipments during the coming fiscal year.

In the Grant, Silver State, and Original Baltic present indications are most encouraging.

The great bulk of production for this county is by the Richmond, Eureka Consolidated, Ruby Dunderberg, and the Garrison mines.

The mines which have reported are: Richmond, Bay State, Connolly, Silver Lick, Silver Conner, Dug Out, El Dorado No. 2, Garrison, Eureka Consolidated, Irish Ambassador, and Ruby Dunderberg. Their production was, gold, \$1,167,383; silver, 2,290,729; total, \$3,458,112.

EUREKA COUNTY MINES.

Abstract statement from quarterly assessment roll of the proceeds for the quarter ending September 30, 1880.

Name of mine or company.	Quantity extract- ed.		Gross yield or value.	Total cost.	Net yield or value on which taxes are levied.
	<i>Tons.</i>	<i>Pounds.</i>			
Eureka Consolidated Mining Company	8, 104	-----	\$273, 168 45	\$273, 158 60	\$55, 232 85
Grant Mining Company	35	1, 057	5, 550 83	4, 625 70	925 13
Geddes & Bertrand	119	75	4, 722 25	4, 799 59	103 34
Dunderberg	1, 132	218	48, 831 81	40, 390 85	8, 440 96
Jackson	190	907	7, 415 04	5, 305 82	109 22
Mountain Boy	19	1, 866	3, 100 26	2, 600 26	500 00
Phoenix	30	894	1, 513 50	1, 103 37	410 13
Williamsburg	488	1, 461	11, 856 61	9, 061 39	2, 795 22
Richmond	10, 989	-----	422, 526 00	246, 300 46	176, 235 54
Alexandria	5	745	408 27	410 48	-----
Arizona	5	1, 488	634 19	729 97	-----
Bald Eagle	25	1, 400	896 57	1, 091 50	-----
Bully Boy	12	100	265 10	580 50	-----
Connolly	172	860	3, 056 19	4, 315 00	-----
California	89	1, 470	1, 839 53	2, 077 35	-----
Champion	4	1, 976	379 28	398 82	-----
Dug Out	56	844	4, 276 97	4, 225 30	-----
Elko	25	82	778 48	1, 076 00	-----
El Dorado	13	629	415 95	586 19	-----
Featherstone	-----	640	39 80	57 80	-----
Good Hope	-----	1, 140	339 25	371 84	-----
Gila	3	826	791 81	1, 056 95	-----
Hoosac	24	945	639 85	1, 864 72	-----
Irish Ambassador	3	937	346 49	1, 572 98	-----
Idaho	9	708	220 41	238 54	-----
Lone Pine	5	1, 122	145 79	280 62	-----
Macon City	26	421	1, 239 45	1, 867 52	-----
North Star	6	780	219 76	293 90	-----
Paul Pry	62	1, 369	1, 671 80	1, 681 80	-----
Pioneer	4	1, 483	171 43	188 56	-----
Roma	6	1, 372	217 44	231 58	-----
Relief	6	1, 245	307 10	421 25	-----
Swallow	14	250	621 04	725 75	-----
Silver Chamber	1	928	215 44	226 00	-----
Silver Wedge	6	670	228 06	243 35	-----
Star	8	1, 429	211 93	246 57	-----
Uncle Sam	5	679	164 39	180 53	-----
Williams	61	1, 684	2, 464 42	3, 406 38	-----
War Eagle	25	1, 375	481 30	559 87	-----
Total	21, 799	663	802, 370 49	565, 390 55	244, 752 39

YIELD OF THE EUREKA MINES.

Following is a statement of the bullion yield of the Eureka mines during the quarter ending December 31, 1880, as reported by County Assessor Wallace, of Eureka County:

Name of mine or company.	Quantity extracted.		Gross yield or value.	Total cost.	Net yield or value on which taxes are levied.	Total amount of tax.
	Tons.	Pounds.				
Adelphi	16	1,462	\$1,013 33	\$1,277 24		
Alexandria	28	1,371	1,210 44	3,398 85		
Allegheny	6	1,000	109 56	185 56		
Banner	27	469	648 24	941 34		
Connelly	89	1,085	1,464 07	2,034 67		
Corless	10	1,876	191 41	482 63		
California	385	1,047	8,609 94	9,280 23	\$320 71	\$6 41
Dunderberg	1,071		24,454 38	39,463 52		
Delaware No. 2	12	1,869	385 77	792 84		
Dug Out	30		3,175 35	3,400 00		
Eureka Consolidated	7,500		339,500 90	231,389 39	108,111 51	2,162 23
Erie	29	940	695 59	770 64		
Excelsior	8	1,000	188 05	335 48		
El Dorado No. 2	6	1,390	100 00	170 00		
Garrison	150		25,488 00	14,850 00	10,638 00	212 76
Grant	16	957	1,281 83	1,730 32		
Hoosac	3	1,944	95 32	111 72		
Ida	7		509 47	1,000 05		
Irish Ambassador	6	1,085	1,290 82	1,598 43		
Jackson	34	1,380	1,952 41	10,234 44	260 63	5 21
Lone Pine	80	1,429	2,773 63	2,408 69		
Macon City	14	1,187	534 71	723 93	364 94	7 30
Monroe	5	1,247	287 59	413 72		
Mineral Hill	52	1,842	3,753 42	4,707 71		
Magenta	2	1,800	372 48	520 30		
Oriental & Belmont	237		3,797 00	4,013 24		
Peterson	2	275	97 65	529 97		
Pearson & White	11	1,368	257 04	426 44		
Phoenix	5		377 62	502 50		
Pentin	4	637	217 64	352 18		
Piute	7		330 71	666 00		
Pioneer	14	1,066	495 86	547 00		
Paul Pry	28	680	1,154 49	1,196 06		
Richmond Company of Nevada	10,665		407,131 42	263,944 19	143,187 23	2,863 74
Silver Connor	36	1,418	2,211 07	4,141 34		
Whippoorwill	24	1,245	603 26	854 47		
Williamsburg	377	1,153	7,314 26	7,159 38	154 88	3 10
Williams	45	1,531	4,651 12	4,071 19	579 93	11 50
West Giant	4		568 16	1,020 00		
Zulu	12	510	246 67	387 05		
Total	21,144	404	855,694 04	629,487 10	263,617 82	5,272 34

The following is from the Leader:

EUREKA DISTRICT.—In reviewing the quarterly statements of Assessor Wallace on the proceeds of mines for the year 1880, we find that the gross yield of the district for the year amounts to the grand total of \$3,366,030.23. The total amount of ore extracted for the year sums up 89,490 tons, and total cost for extraction, transportation, and reduction was \$2,358,613.49. The tax realized by the county on the year's proceeds was \$21,083.50. The Eureka Consolidated worked during 1880 36,634 tons of ore, which produced a gross yield of \$1,295,253.46. The Richmond turned out 39,887 tons, making a gross yield of \$1,582,214.16. The Ruby Dunderberg worked 2,869 tons of ore, returning a gross yield of \$97,014.98. And the Williamsburg gave a gross yield of \$25,621.89 as the product of 1,115 tons of ore.

HUMBOLDT COUNTY,

In the northwestern corner of the State, abounds in mineral productions. Sulphur and salt are found in the desert plains and alkali flats. In the mountain ranges, the precious metals, copper, lead, and antimony are produced in quantities.

The chief mining camps lie along the Humboldt River, in the ranges of the eastern half of the county. Below are the districts most active at present.

Paradise district, on the Little Humboldt, is one of the busiest. Here are the Bullion and Paradise Valley mines, two among the richest in the county, and which produce the majority of the bullion shipped and credited to the county.

Rebel Creek and Mineral Creek camps, in the ledges skirting the northern portion of the district, are making some good development.

The comparatively new locations are the Mary Wilder, Iowa Consolidated, Ethan Allen, Ohio, and Columbia. The Ohio is fast becoming one of the best-paying mines in the district and county.

In Winnemucca district the Humboldt Reduction Works are again in operation, which means an increased production in next report for the district and county.

In Dun Glen district, the Lang Syne, the Wright, and the Monteith are doing work that is paying well. The Monteith is in a very fine ledge of rich ore, and the output promised will be somewhat astonishing.

The Lang Syne mill is the only one in that part of the county nearer than Unionville. Various other mines are in progress of development, but nothing authoritative could be learned of their condition or of their prospects of becoming yielders in the near future.

Star Mining district, in the Star range, is one of the best in the county, but complaints are made of the abandonment of many claims. At Unionville, there are three mills but no smelters. Many of the mines at Unionville have fallen into the hands of Chinese, who took out during the fiscal year \$8,850. Bullion here is principally silver, averaging 500 fine. Here are the Arizona Silver, Lucky Dog, and De Soto mines. The Montezuma mine, near Okana, in process of development, reports a rich strike of ore. Six miles south of Unionville is Indian district, where work has been recommenced on the old Moonlight mine.

I X L district is a new district in the Silver Hill range, in the extreme southeastern corner of the county.

Reports are frequent of the value of the new locations, and the following mines are now worked with reputed success: Bayfield, Black Prince, Annie Allen, Iron Point, Mammoth, Estella, and Great Western.

The following mines have made reports: Vandewater, Ohio, Bullion, Paradise Valley, Lang Syne, De Sota, Arizona Silver, Mary Wilder, Rye Patch Mill, Wright & Wentworth, Lucky Dog, Nevada Mill, Glory, and Mount Rosa. Their production, with \$8,850 gold produced by Chinese, was: Gold, \$78,994; silver, \$271,452; total, \$350,446.

LANDER COUNTY.

We learn, through Mr. M. J. Farrell, of the Manhattan mine and mill at Austin, that there is a general revival of mining interests in this part of the county consequent upon the completion of the Nevada Central Railroad to Austin, and its contemplated extension southward; but another year will be required to give these prospects such shape as would lead to definite information. The general prospects of the county are better than ever before, and a year or two more will give it and the neighboring districts of Nye County a prominent position as a producer of bullion.

The principal mining districts are at Austin, the center of the Reese River country, Lewis and Galena.

At Austin, the Manhattan mill and mine has been turning out im-

mense quantites of bullion for the past thirteen years. It has the only mill in the district, and works the ores of the numerous mines, mostly small ones, as well as those of the Manhattan, under the head of custom ores.

The entire ores of the district, good, bad, and indifferent, for the last thirteen years, have averaged over \$230 per ton. As the grade is so high, and the veins small, the district does not require much milling power.

The product of many mines is so small that likely the entire production is included in the output of the Manhattan mill. Of Galena district the following reliable information has been received: No new mines have been developed, but an important discovery was made in gold of large quantities in lodes so far considered worthless. This gold region, as far as known at present, extends south of Duck Creek, a half mile east of Galena, for two square miles. The lodes, 5 to 75 feet in width, carry magnetic iron (like the Bodie lodes), arsenical iron, and copper pyrites—all gold bearing, and pure gold in large quantities. They are, in fact, the southern portion of lodes of the White and Shiloh and Trinity belts, known and worked for many years.

The following claims have been made and are under process of development: Bunker Hill, Humbug, Plumas, Wilson's, and Gold Ring.

The roasting and leaching works of the White and Shiloh mill are a complete success for working the most rebellious ores.

The Mountain mill, on Duck Creek, erected during the past summer, is now engaged in experimental efforts. There are no smelters in the neighborhood, nor are they needed, as carbonates are quite rare and probably never enough in quantity to serve as a flux for the galena, and the general character of it is rendered rather difficult for smelting by the large percentage of blende and iron pyrites present. The Defiance, Emily Ann, and the White and Shiloh are the principal mines of this district.

The Silver Point is a new mine just opened. In Lewis district no new mines have been discovered during the past year. The Betty O'Neil is reported to improve in size of vein and richness of ore as greater depths are reached. This mine and the Eagle are the most important in the district. The Eagle and the Star and Grove are the only mills.

The mines which have reported are: Manhattan, Eagle Silver, Betty O'Neil, Jackson, Trinity, Defiance, White and Shiloh, and Emily Ann. Their production amounted to: gold, \$760; silver, \$1,044,546; total, \$1,045,306.

LINCOLN COUNTY.

The mining districts now offering any inducements are few and scattered, lying principally in the northern part of the county. Returns of production have been received from the districts of Bristol and Pioche.

In Pioche district the Raymond and Ely takes the lead. Here the Bullionville Smelting Company has been fitting works for reduction, amalgamation, and smelting tailings. These works were much needed, as the chloriders of the district held much ore on hand for shipment.

In Bristol district the Hillside mine is keeping up its production, is the heaviest yielder in the county, and some important developments have been recently made which will add greatly to its productiveness.

The Bristol Silver Mining Company was organized in December, 1879. This is a Minnesota company which owns the Ohio and interests in the Mayflower, and in several other mines within the district. This com-

pany was engaged previous to August, 1880, in building a 10-stamp dry crushing mill; hence we have no returns from it. Although the mill has been running constantly since the close of the fiscal year it will no doubt make a good showing in the next report.

The Mendhe mine is paying well with splendid ore in sight. Other mines are the Tempest, Iron, and the Bay State.

Much work is done in the range where the Bristol company is located, and many good prospects have been opened.

Reports from Hiko district promise a revival in the mines there.

Advice from Tem-pah-ute report that camp in a dilapidated condition owing to mismanagement of mining affairs. The assays of ore are encouraging. The Great Western Tunnel Company has three claims in the south end of the mountain, and have run a tunnel of 80 feet, expecting to reach the main ledge at a distance less than 400 feet.

The new excitement of the county is directed toward the mines of El Dorado Cañon in the extreme southern part of the county, bounded by San Bernardino County, California, and the Colorado River.

Some twenty new locations are reported of easy access from the Southwestern Mining Company's mill of 15 stamps.

The mines which have reported are Raymond and Ely, Day, Hillside, and Mende, with a production of gold, \$7,861; silver, \$444,717; total, \$452,578.

LYON COUNTY.

Its mines are in the branches which the great Comstock ledge sends off to the east and south.

The mines of Dayton and Silver City have been extensively worked. The Young and Sirlott mine and mill at the latter place, and the Lyon mill and mine at Dayton, furnish almost the entire bullion shipments of the county.

The Irwin mine, at Silver City, shows considerable promise, it being energetically worked, and in case of continued success may lead to resumption of work in a number of mines in the immediate vicinity.

At Dayton very little is being done, and no new discoveries have been made during the year.

But three mines have made reports, viz: Young and Sirlott mill, Lyon mill, and North Rapidan. Their production was, gold, \$23,773; silver, \$146,821; total, \$170,594.

NYE COUNTY.

Gold and silver are found in the many mountain ranges that cover the northern and western portion of this county. The ores carry but a small percentage of gold, but in many cases the ledges display a large quantity of surface ore. The principal districts now producing are Union, Philadelphia, Morey, Spanish Belt, and Tybo.

The mines at Downieville, Ellsworth, Lodi, Ophir Cañon, Jut Cañon and Northumberland are worthy of a trial with increased capital.

At Grantsville, in Union district, the Alexander mine, which is the most productive mine in the county, is making steady shipments of bullion. The Brooklyn is also a profitable mine.

The Alexander mine is perhaps one of the richest in the State, showing an immense body of surface ore which appears almost inexhaustible.

In the same wide mineral belt the Triumph Mining Company are making valuable and extensive preparations in hoisting and pumping

works, and are sinking a shaft with every prospect of success, as their mine joins that of the Alexander.

The new locations are the Chicago, Harvey, Success, Lefler, Elizabeth and Alexander.

The mines of Philadelphia district are mostly shut down for the present. The Belmont produces regularly, and recent extensions of the stopes are developing fine bodies of ore.

In Spanish Belt district the Barcelona Company's mines are opening out favorably in the new levels. The Morey mines were worked several years ago with poor success. They are now in the hands of a New York firm, which is developing them hopefully, as the ores improve as greater depths are reached. The mines in the vicinity are looking for larger yield when reduction works shall be built.

Tybo district is in the Hot Creek Mountains. The mill output shows an increase in production, and indeed this district sends in returns only second to Grantsville in Union district.

The percentage of gold is larger than in the ores of other parts of the county.

The following-named mines have reported: Brooklyn, Tybo Consolidated, Hillside, Gila, Belmont, Alexander, Morey, Barcelona, Forlorn, Liberty, Good Hope, La Salle, Fisherman, and Great Western. Their production was gold, \$28,572; silver, \$855,432; total, \$884,004.

The Gold Mountain county, after lying apparently quiescent for a number of years, is just now looming into considerable prominence, on account of the extensive operations on the old State Line mine by a New York and Nevada company. From T. F. A. Connelly, who has just returned from Gold Mountain, we learn the following interesting points:

The mine is located in Nevada, about 7 miles from the eastern boundary line of this State, and is situated near the dividing line between Esmeralda and Nye Counties, Nevada. The route from Independence is via Big Pine and Deep Spring Valley, thence to Lida Valley and Gold Mountain—a distance of 115 miles. On an air line the State Line mine is a little north of east about 50 miles distant from Independence.

About 150 men are now in the camp, some of them engaged in laying out a town, though a large majority are simply waiting for the company to commence active operations. But little work is being done at the present time, except grading for the mills. Some of the machinery is already on the ground, but it will probably be two months before enough has arrived, together with lumber, to commence building.

Two 40-stamp mills will be erected on the same site. Water will be brought a distance of about 13 miles, the company having ordered 65,000 feet of 6-inch iron pipe for this purpose. The cost of these works will be about \$80,000. Mr. J. M. Taylor is acting as manager for the company, and Dr. Garvin as superintendent. The State Line ledge is in a granite formation, and shows huge quartz croppings for a distance of about 100,000 feet. Five shafts have been sunk on the vein to a depth varying from 15 to 80 feet. The ledge in the bottom of these shafts shows an average width of 11 feet. The ore is a whitish quartz, streaked and spotted with iron oxide. The gold can be seen in some of the samples brought in, and probably a large percentage of that metal is in a free condition. Assays of the ore vary from \$10 to \$100 a ton, and the average is presumed to be about \$30.

ORMSBY COUNTY.

We learn through Mr. Bence, county assessor, that there are no bullion-producing mines at present in this county.

The Vattain will likely yield a fair amount of bullion within the coming year, while many other mines have good prospects under proper management.

The only bullion produced at present is extracted from tailings at the quartz mills on Carson River, the result of ores originally taken from the Comstock mines in Storey County.

STOREY COUNTY.

Of the many hundreds of mines in this district, only nine report any production for the last half of the fiscal year. Of these the Consolidated Virginia has made the greatest yield, next to it the Union Consolidated, then California, and next to it the Ophir mine. The other mines reporting production are the Sierra Nevada, Monte Christo, Crown Point, Overman, Justice, and Nevada mill and mine, and California.

The Consolidated Virginia, of this county, and the Eureka Consolidated, of Eureka County, are the largest producers in the State.

Active operations are going on in the following mines: The Alta, Benton, Bullion, Utah, Hale and Norcross, Mexican, Savage, Exchequer, Overman, Chollar Potosi, Gould and Curry, Belcher, Silver Hill, Leviathan, and New York. This county produced very nearly one-half of the bullion recorded in the State during the fiscal year.

From the San Francisco Daily Bulletin of March 5, 1880, the following is clipped:

THE TWO MINES OF THE PERIOD.—What the future has in store for the hardy miner it is impossible to predict with any degree of accuracy. Whether another such body of ore will be found as has been taken out of the Consolidated Virginia and California mines no one knows. Nothing so extensive and of such average richness had ever been found before in this country. But this is not conclusive evidence that no other ore bodies of like dimensions and value exist. Prior to the uncovering of this deposit there was nothing to justify a belief in it, and it would be an unwarrantable conceit to assume that history may not repeat itself on a still grander scale. The yield of these two mines to the close of the last fiscal year was as follows:

CONSOLIDATED VIRGINIA.

Year.	Gold.	Silver.	Total.
1873	\$314, 289	\$331, 293	\$645, 582
1874	2, 063, 438	2, 918, 046	4, 981, 484
1875	7, 035, 207	9, 682, 188	16, 717, 395
1876	7, 378, 145	9, 279, 504	16, 657, 649
1877	6, 270, 519	7, 463, 500	13, 734, 019
1878	3, 770, 008	4, 226, 745	7, 996, 753
1879	1, 198, 320	1, 283, 039	2, 481, 359
Total	28, 029, 925	35, 184, 316	63, 214, 241

CALIFORNIA.

1876	6, 490, 381	6, 910, 461	13, 400, 841
1877	9, 384, 051	9, 535, 844	18, 919, 895
1878	5, 552, 585	5, 396, 494	10, 949, 079
1879	1, 333, 511	1, 243, 461	2, 576, 973
Total	22, 760, 528	23, 086, 260	45, 846, 788
Consolidated Virginia	28, 029, 925	35, 184, 316	63, 214, 241
Total	50, 790, 453	58, 270, 576	109, 061, 029

There was a difference of three years in the development of the two mines, but after the opening of the California they were worked together. During the last four years the California produced more bullion than the Consolidated Virginia, and its metal carried about 5 per cent. more gold. The Consolidated Virginia began paying dividends in May, 1874. Up to the close of the last fiscal year it had paid 51 dividends, aggregating \$42,390,000. Ten of these dividends were at the rate of \$3 per share on 108,000 shares; thirteen at the rate of \$10 per share on the same number of shares; twenty-one at the rate of \$2 per share on 540,000 shares; and two at the rate of \$1 and five at the rate of 50 cents per share on the same number of shares. The California commenced paying dividends in May, 1876, and up to the close of the last fiscal year it had paid 34 dividends, aggregating \$31,320,000. Of these, twenty-six were at the rate of \$2 per share, four of \$1 and four of 50 cents per share—all on the basis of an

issue of 540,000 shares. The total product and dividends of both mines to the close of the last fiscal year were as follows:

Product.....	\$109,061,029
Dividends.....	73,710,000
Expenses, discount, &c.....	35,351,029

On the Comstock it has not been a prosperous year. The stock market affects that section of the country more than any other, as that section of country affects the stock market. No bonanzas having been developed, no stock market boom was raised. Work continues, however, in the lower levels of the big mines, and some magnificent pumping machinery has recently been put up.

The two principal mines on the Comstock, the California and Consolidated Virginia, made this year what would elsewhere be considered heavy productions. The California produced \$890,515, and the Consolidated Virginia \$1,756,536, an aggregate of \$2,647,151.

As we have taken the figures of expenses and production of a representative California mine, we will here take the figures of 1880 of a representative Nevada mine—the Consolidated Virginia:

This representative and noted bullion-producing mine, which has yielded a total of \$64,970,777 since it was opened, produced this year \$1,045,413.92 in gold and \$711,122.57 in silver, an aggregate of \$1,756,536.49. Average ore value per ton, \$31.76. Ounces fine silver for 1880, 54,977,650; average value per ounce, dore, \$2.86. Weight of bullion produced during the year, 21 tons and 102 pounds. Ounces fine silver produced to date, 2,768,356,030; total weight, 1,159 tons 782 pounds. Total number of bars, 17,860. Ore on hand December 31, 1879, 135 tons; ore extracted during 1880, 55,562; total, 55,697 tons; ore reduced, 55,315 tons and 400 pounds; on hand January 1, 1881, 381 tons and 1,600 pounds; total cost per ton for extraction and reduction, \$17.04. They have now on hand at the mills and in the ore-houses 381 tons and 1,600 pounds, valued by assay at \$12,125.96. In addition to the ore extracted there have been raised from the mine during the past year 14,325 tons of waste rock.

To show the great cost of mining such an extensive mine, we append the financial statement which gives the items:

RECEIPTS FOR THE YEAR 1880.

Cash on hand January 1, 1880.....	\$5,794 74
Samples.....	274 77
Rebate.....	168 80
Assaying.....	18,764 41
Supplies.....	13,694 44
B. & B. joint department.....	12,331 95
Drafts on secretary.....	1,073,682 33
Samples produced.....	933 02
Total.....	1,125,644 46

DISBURSEMENTS FOR THE YEAR 1880.

Salaries.....	\$6,160 00
Wages.....	214,132 25
Wood.....	4,767 50
Timber.....	35,343 26
Water and ice.....	10,776 80
Candles.....	5,632 00
Powder, fuse, and caps.....	8,214 62
Miscellaneous supplies.....	13,849 53
Office expense.....	847 20
Assay office wages.....	10,601 50
Assay office supplies.....	7,268 61
Team expense.....	410 70
Legal expense.....	15,485 16
Taxes on real estate.....	2,389 12
Taxes on proceeds.....	35,507 88
Hoisting.....	61,644 00
Reduction.....	497,836 80
Construction—half expense of C. & C. shaft.....	98,500 00
Sutro tunnel, half royalty.....	33,977 50
Sutro tunnel, account of lateral drift.....	49,980 00
Hospital and contribution.....	40 00
Interest and exchange.....	3,115 93
Transportation and hauling.....	1,419 69
B. & B. joint winze.....	4,967 12
Samples shipped.....	1,053 39

Samples on hand.....	\$154 40
Cash on hand.....	1,569 50
Total.....	1,125,644 46

ACTUAL COST OF MINE.

Supplies on hand January 1, 1880.....	\$5,000 00
Salaries and wages.....	220,292 25
Water and ice.....	10,776 80
Miscellaneous supplies.....	67,806 91
Office expense.....	847 20
Assay expense.....	17,870 11
Team expense.....	410 70
Legal expense.....	15,485 00
Taxes.....	37,897 00
Hoisting.....	61,644 00
Reduction.....	497,836 80
Sutro tunnel, ore royalty.....	33,977 50
Contribution.....	40 00
Interest and exchange.....	3,115 93
Transportation.....	1,419 69
Best & Belcher joint winze.....	4,967 12

Total.....	979,387 17
------------	------------

Sale of supplies.....	\$13,694 44
Rebate.....	168 80
Assaying.....	18,764 41
Balance—being actual cost of mine.....	946,759 52

Total	979,387 17
-------------	------------

Average cost per ton	\$17 04
Half expenses C. & C. joint shaft	98,500 00
Entire cost joint shaft to date	1,553,462 80
Sutro tunnel lateral drift.....	49,980 00
Average daily wages	4 05

INVENTORY OF PROPERTY.

Real estate	\$12,500
Hoisting works	10,000
Machinery	50,000
Superintendent's and assay office	50,000

Total	\$122,500
Depreciation in value the past year	70,500
Valuation at last report	193,000

INVENTORY OF C AND C SHAFT.

Real estate	\$15,000 00
Hoisting works and all machinery	350,000 00
375 cords wood	3,375 00
250,000 feet timber	4,500 00
Stone coal	320 00
5 tons steel.....	1,600 00
4,576 pounds plate iron	326 30
30 tons iron	360 00
202 boxes candles	1,212 00
595 gallons oil.....	595 00
1,200 bushels charcoal	348 00
Gas pipe	144 00
Miscellaneous supplies.....	7,500 00

Total	385,280 30
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BULLION YIELD FOR THE YEAR.

Gold.....	\$1,045,413 92
Silver	711,122 57

Total	1,756,536 49
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TOTAL PRODUCTION TO DATE.

Gold.....	\$29,075,338 89
Silver.....	35,895,439 06

Total 64,970,777 95

In addition to the above, the matter of the C. & C. shaft is to be considered. They received from various sources toward work on the shaft \$442,359.33, and a like amount was expended. In these expenditures the following items are the heaviest: Wages, \$140,362; candles, \$140.93; powder, caps, and fuse, \$19,970; timber, \$64,283; wood, \$108,613; ice, \$16,975; wire cables, \$8,412.

We can give briefly, also, the figures which show the year's work of the California mine: During the past year, ending December 31, 1880, there were extracted from the mine 37,454 tons of ore. There were remaining in the ore-houses and at the mills at the end of the year 905½ tons of ore. There have been reduced 38,395 tons, yielding bullion to the value of \$890,515.33, or \$23.21 per ton; this yield being over 75 per cent of the assay value of the ore, no allowance being made for moisture.

The value of the gold contained in the bullion was \$247,728.89, and of the silver \$342,786.44.

In addition to the ore extracted, there have been raised from the mine 10,368 tons of waste rock.

Space will not admit of the publication in full of the financial statements accompanying the report of this company. Expenditures amount to \$817,188.48, and following are some of the principal items: Salaries and wages, \$149,688.50; Ophir, etc., for labor, \$26,494.87; timber, wood, ice, etc., \$56,014.60; total taxes, \$12,879.70; reduction, \$345,238.20; half expenses C. & C. shaft, \$98,500; Sutro tunnel royalty, etc., \$63,932.30. The actual cost of the mine was \$675,144.29; cost per ton, \$17.60; average daily wages, \$4.03. Ounces of fine silver in the year's output, 26,475,790; value per ounce, \$2.97½; weight of bullion, 10 tons 479 pounds; number of bars, 164. Total production to date:

Gold.....	\$23,310,281 98
Silver.....	23,432,490 12

Total 46,742,772 10

Ounces fine silver to date, 1,812,237,340; weight, 664 tons 450 pounds; number of bars, 11,020.

These two great mines have produced together \$129,720,559.05, a sum of money difficult to imagine even, as coming out of a couple of holes in the ground. Some newer sections of country, about which a great deal of stir is being made, and which have produced a few millions, have made more fuss about them than has been made about the two mines mentioned. It must be remembered that two mines, only, produced this immense sum, and are still producing, between them, two and a half millions of dollars a year.

The following is a statement of the yield of the mines, tax, and depth of workings on the Comstock:

STOREY COUNTY BULLION TAX.—Abstract from the quarterly assessment roll of the proceeds of the mines of Storey County for the quarter ending September 30, 1880, is as follows:

Number of tons of ore extracted and value per ton—Belcher, 1,362½ tons, \$15; Crown Point, 107 tons, \$12; California, 9,628½ tons, \$27; Consolidated Virginia, 12,159 tons, \$35; Consolidated Imperial, 3,404 tons, \$11; Monte Cristo, 510 tons, \$11; Savage, 48 tons, 750 pounds, \$50.

Name of mine or owner.	Gross yield of value.	Net yield.	Total tax.
Belcher.....	\$20,188 70	\$4,037 75	\$125 17
Crown Point.....	1,318 52	263 70	8 17
California.....	260,727 57	59,672 96	1,521 66
Consolidated Virginia.....	429,563 84	171,825 53	4,381 55
Consolidated Imperial.....	40,046 00	4,004 60	124 14
Monte Cristo.....	5,510 00	551 00	14 05
Savage.....	2,476 34	990 53	25 26
Total.....			6,200 00
TAILINGS.			
J. H. Hitchcock.....	1,237 50	123 75	3 16
George Jennings.....	1,331 75	133 17	3 40
Mariposa Mill.....	2,277 19	227 71	5 81
Omega Mill.....	82,356 61	19,467 92	496 43
Peter Secord.....	500 00	50 00	1 27½
C. Bastian and B. Pfeifer.....	3,000 00	300 00	7 65
Total.....			517 72½

YIELD OF THE COMSTOCK MINES.—Following is the statement of the bullion yield of the Comstock mines during the quarter ending December 31, 1880, as reported by County Assessor J. P. Dunne, of Storey County:

Mine or company.	Tons extracted.	Gross yield or value.	Net yield.	Tax.
Belcher	1,636	\$22,601 46	\$4,520 29	\$115 27
Crown Point	308	3,830 24	766 04	19 53
Consolidated Virginia	13,208	237,875 16	47,575 03	1,213 16
California	12,252	189,750 31	37,950 03	967 73
Consolidated Imperial	2,844	31,281 00	3,128 10	79 77
Monte Cristo	480	6,210 00	1,242 00	31 67
Savage	53	1,463 02	292 60	7 46
Sierra Nevada	668	16,788 39	3,357 68	85 62
Union Consolidated	1,621	49,240 31	19,696 13	502 25
TAILINGS.				
Bastian & Pfeiffer	300	1,500 00	150 00	3 83
J. H. Hitchcock	250	1,250 00	125 00	3 19
George Jennings	189	1,167 00	1,116 70	2 98
Mariposa	3,322	2,686 17	1,919 78	48 95
Omega	10,509	2,447 02	10,866 77	277 10
Peter Secerd	50	150 00	15 75	30
Total	47,670	628,240 38	131,721 90	3,358 81

Depths of the workings in the principal mines on the Comstock.

	Feet.		Feet.
Utah	2,150	Combination shaft	2,400
Sierra Nevada	2,500	Julia	2,450
Union Consolidated	2,600	Bullion	2,450
Mexican	2,600	Imperial	2,800
Ophir	2,600	Yellow Jacket	3,000
California	2,500	Crown Point	2,700
Consolidated Virginia	2,500	Belcher	3,000
Best & Belcher	2,200	Overman	2,275
Gould & Curry	1,900	Forman shaft	1,650
Savage	2,400	Alta	2,050
Hale & Norcross	2,400	Benton	2,050
Chollar-Potosi	2,400	Silver Hill	1,500

The Mining and Scientific Press, of San Francisco, says:

The Consolidated Virginia mine, on the Comstock, has produced, up to December 31, 1880, the sum of \$64,970,777.95. Of this \$29,075,338.89 was gold and \$35,895,439.06 was silver, so it is not all silver, by any means, that comes from the Comstock, as many persons believe. The California mine yielded last year \$890,515, of which \$247,728 was gold. This mine has also produced immensely. Its total production has mounted up to \$46,742,718.17, of which \$23,310,231.98 was gold. These two great mines have therefore produced \$129,720,559.05, a pretty round sum when carefully considered, and an amount it will take some extensively advertised camps a good many years to overshadow. We speak of only two mines on the Comstock, although there are many others which have produced many millions. We hope some of the Colorado men particularly will take note of these figures, since they imagine that Leadville has already produced more than the Comstock. Leadville claims to have produced this year \$15,095,133; in 1879, it produced \$10,189,521; in 1878, \$3,152,925, and in 1877, \$555,330. From 1860 to 1880, both years inclusive, Leadville produced a little over \$35,000,000, a little more than half, in its whole existence, more than one mine alone on the Comstock produced.

The Mining Record gives the Comstock pay-rolls for January, 1881, as—

Sierra Nevada	\$18,150 00
Union Consolidated	14,134 00
Union shaft	22,540 87
Ophir and Mexican	20,467 50
Consolidated Virginia, California, and C. & C. shaft	38,211 62
Gould and Curry and B. & B. shaft	- 9,075 00

Savage.....	\$7,092 25
Hale & Norcross.....	13,404 13
Chollar-Potosi and C. N. S. shaft.....	12,855 00
Belcher and air shaft.....	4,350 00
Forman shaft.....	7,741 82
Overman.....	4,360 85
Caledonia.....	1,444 00
Total.....	173,827 04

The mines which have reported are: Union Consolidated, California, Consolidated Virginia; Sierra Nevada, Ophir, Monte Christo, Nevada Mill, Justice, Crown Point, and Overman. Their production amounted to: Gold, \$3,323,840; silver, 3,084,142; total, \$6,407,982.

WASHOE COUNTY.

Makes no report of production for the fiscal year ending June, 1880.

In correspondence with various mine-owners of this county we have elicited the following brief information: There are many mines which are beginning to produce and promise a good showing for the next report. Many have their ore upon the dump, with no clean-up.

Eight mines send reports of the hopeful condition of their claims.

WHITE PINE COUNTY.

The most productive districts are now on Cherry Creek and Ward.

In Cherry Creek district are the Star mining and milling, and the Exchange mine and mill, which with the Martin White mill and mine, of Ward district, are the only large producers in the county. The Martin White Company now own the Mountain Pride, Paymaster, Young America, Defiance, Mammoth, and Caroline, and are negotiating for other claims. This company has run a tunnel 2,100 feet in length, from which, by cross-cuts and drifts, it expects to perfectly prospect its various claims.

In the old White Pine district considerable prospecting is going on around the mountain and Treasure Hill. Recent strikes are reported in several of the mines, but the returns have been very meager. In the southern and eastern part of the county is Lexington district, which is attracting recent attention. It is situated on the southeast of Jeff Davis Peak and 250 miles southwest of Salt Lake City, in Utah. This region, although known for years, has received but little notice, owing to its very inaccessible position. The completion of the Utah Southern Railroad will bring it within reach of capital, and its pleasant situation on the eastern slope of the mountain range, with the unusual accessories of wood, water, and grass, will make it ere long a favored point for the proprietor, if the present reports of the high grade of its ores are confirmed by developments.

The mines which have reported are: Star, Martin White mill, Exchange, and Stafford. They have produced: Gold, \$18,396; silver, \$547,929; total, \$566,325.

From Dayton, Nev., Mr. J. E. Gignoux, superintendent of the Lyon Mill and Mining Company, reports the following:

Such of the mills on the Carson River as are in operation at the present time are reducing tailings that in times gone by were produced from Comstock ore. These tailings were collected in reservoirs at the various mills, also in larger quantities on the flats at the outlets of Dana, Gold, and Six-Mile Cañons. They are mostly worked by water power, the mode of reduction having been improved and economized to so great an extent as to allow of the treatment of material which a few years ago was considered worthless. Not an unimportant factor in this connection is the low price of quicksilver; neither can we lose sight of the discount on silver bullion; a material change in the price of either might cause the entire suspension of the industry. The expression "tailing" is generally made to include the slimes, or battery overflows,

which are by far richer than the tailings proper, or pan residues. The slimes settle in the portions of the reservoirs least subjected to water currents. In an amalgamating pan the slimes form a pasty mass, which has a tendency to hold the quicksilver suspended and carry it off. To obviate this sand is added, generally one-half, and sometimes twice the quantity. It depends upon the amount of calcareous mineral present. The charges thus prepared do not, as a general thing, assay more than \$6 a ton.

The treatment is termed base, as from 15 to 20 pounds of copper sulphate to the ton is usual. This copper is reclaimed in a great measure by the subsequent refining operation. The process is more successful when the amalgam is not finer than 200. The pans are generally wooden and of two and four tons capacity. Charges are made every four hours. Salt, copper, and quicksilver are added at the commencement of the operation, when steam is also given. Simple mullers are used, as no grinding is required. The settlers are of a sufficient size to allow the charge to be diluted with water until quicksilver particles will no longer remain suspended. The charge is kept in motion in the settler for four hours, or until the next pan charge is to be drawn; there being a settler for each pan. The quicksilver is obtained from bowls, which are connected by pipes with the settler bottoms, is strained directly and re-torted in large retorts of the usual form. These are gradually heated for about twelve hours. The gold, copper, and what foreign matter was present in the amalgam form a spongy mass, which is easily separated from the silver, which forms a compact scale next to the iron of the retorts. By a mechanical separation base and white metal are obtained. These are separately treated, although the refining operation undergone is precisely the same in both cases. The bullion is broken into lumps about the size of an egg and thrown into a moderately heated one-hearth reverberatory furnace. Here it remains several hours, when the metal oxidizes to a certain extent and becomes sufficiently brittle to allow of crushing and passing through a fine sieve. It is then divided into charges and submitted to an oxidizing flame in the furnace, constant stirring being required. The roasted mass is then treated in a bath of sulphuric acid. The copper is taken up as a sulphate of oxide of copper, also a small portion of silver. This is precipitated by metallic copper in the form of fine silver, which is filtered and washed, and when melted is about 999 fine. The residue from treatment of the white metal gives bullion about 985 fine, while the base contains the gold. The liquor from the bath, subsequent to the precipitation of silver with copper, is conducted into tubs and allowed to crystallize into commercial bluestone.

The accompanying statement is taken from the county auditor's books of Lyon County, where each company is required by law to file a sworn statement quarterly for assessment purposes. It covers the four last quarters:

Name of company.	Number of tons extracted.	Value per ton.	Gross yield.	Cost of extraction.	Net yield.
Pacific Mill Company.....	12,150	\$12 47	\$149,644 15	\$83,856 00	\$65,788 15
Union Mill Company.....	7,155	3 89	27,846 81	19,545 49	8,301 32
Lyon Mill and Mining Company.....	35,329	3 58	128,177 00	116,555 55	11,621 45
Woodworth Mill Company.....	11,518	5 53	47,154 12	48,515 38	-----
French Mill.....	1,560	8 09	12,625 12	2,720 00	9,905 12
Atlanta Mill Company.....	4 580	3 21	18,929 24	16,905 00	2,024 24
Eureka Mill.....	-----	3 23	8,399 73	6,336 85	2,062 88

Summary of bullion production for Nevada, by counties, for the fiscal year ending June 30, 1880, as reported from the mines.

County.	Gold.	Silver.	Total.
Elko.....	\$68,538	\$885,184	\$953,722
Esmeralda.....	953	1,282,800	1,283,753
Eureka.....	1,167,383	2,290,729	3,458,112
Humboldt.....	78,994	271,452	350,446
Lyon.....	23,773	146,821	170,594
Lincoln.....	7,861	444,717	452,578
Lander.....	760	1,044,546	1,045,306
Nye.....	28,572	855,432	884,004
Storey.....	3,323,840	3,084,142	6,407,982
White Pine.....	18,396	547,929	566,325
Total.....	4,719,070	10,853,752	15,572,823

Statement of the bullion production of some of the mines of Nevada, prepared at the Mint Bureau from tables published by the Mining Record of New York.

Mine.	January 1 to December 31, 1879.	January 1 to June 30, 1880.	Fiscal year 1880.*	Calendar year 1880.
Alexander, Nye County.....	\$385,710	\$137,300	\$330,155	\$236,152
Argenta.....	79,326	86,396	126,059	118,870
Belmont.....	37,000	26,419	44,919	26,419
Belle Isle.....	552,848	.....	276,424	21,589
Betty O'Neal.....	.....	.....	.....	31,474
Columbia Consolidated.....	7,600	.....	3,800	10,121
California Mine.....	2,574,992	439,075	1,729,571	886,698
Consolidated Virginia.....	2,479,970	1,088,165	2,328,150	1,755,020
Day (Jack Rabbit).....	4,300	10,847	12,997	12,875
Endowment.....	14,386	4,525	11,718	4,525
Eureka Consolidated.....	2,743,400	685,194	2,056,894	1,533,394
Extra.....	157,000	18,800	97,300	18,800
Eagle.....	.....	.....	.....	.....
Gila.....	24,826	.....	12,413	.....
Grand Prize.....	301,886	90,000	240,693	281,604
Hillside.....	.....	112,792	112,792	139,892
Highbridge.....	131,100	.....	65,550	.....
Independence.....	263,242	.....	131,621	23,330
Indian Queen.....	80,900	.....	40,450	85,111
Justice.....	10,400	.....	5,200	.....
Kentuck.....	4,300	.....	2,150	.....
Leopard.....	48,382	10,178	34,369	10,178
Manhattan.....	906,224	434,200	887,312	997,400
Martin White.....	467,124	.....	233,562	.....
Mount Diablo.....	.....	.....	.....	128,100
Mount Potosi.....	.....	.....	.....	21,900
Northern Belle.....	823,864	615,394	1,027,326	1,314,367
North Belle Isle.....	.....	.....	.....	51,720
Navajo.....	18,228	.....	9,114	30,367
Oriental Consolidated.....	7,224	.....	3,612	.....
Ophir.....	1,283,690	175,948	817,793	175,948
Paradise Valley.....	222,800	109,300	220,700	155,778
Phoenix.....	30,930	.....	15,465	.....
Raymond & Fly.....	197,338	.....	98,669	.....
Richmond Consolidated.....	1,554,000	912,098	1,689,098	2,549,642
Star.....	312,086	138,700	294,743	307,235
Sierra Nevada.....	79,700	46,422	86,272	46,422
Silver Prize.....	4,908	.....	2,454	.....
Tybo Consolidated.....	178,100	13,447	102,497	49,147
Tuscarora.....	.....	.....	.....	4,700
Trojan.....	26,800	.....	13,400	.....
Union Consolidated.....	.....	905,924	905,924	905,924
Young America.....	.....	.....	.....	4,821
Total.....	16,014,084	6,061,124	14,068,166	11,937,523

* Adding column 2 and one-half of column 1.

Gross yield of the mines in the State of Nevada, tabulated by counties separately, as reported by the county auditors under oath to the State comptroller, for the six months ending December 31, 1879.

Counties.	Quantity worked.		Gross value.
	Tons.	Pounds.	
Elko.....	9,269	960	\$619,021 72
Esmeralda.....	11,497	170	488,703 39
Eureka.....	48,298	696	1,724,876 66
Humboldt.....	8,028	138	198,637 67
Lander.....	3,118	950	301,307 31
Lincoln.....	10,180	237	283,856 39
Lyon.....	14,368	.....	68,086 59
Nye.....	12,324	1,465	229,878 82
Ormsby.....	45,616	.....	391,893 89
Storey.....	99,128	1,250	2,884,124 64
White Pine.....	18,553	1,932	348,820 81
Total.....	280,382	1,998	7,639,207 83

For the six months ending June 30, 1880.

Counties.	Quantity worked.		Gross value.
	Tons.	Pounds.	
Elko	3, 056	1, 500	\$147, 197 26
Esmeralda	17, 943	607	556, 862 68
Eureka	44, 476	1, 810	1, 777, 261 03
Humboldt	10, 578	601	201, 280 15
Lander	2, 724	748	278, 621 44
Lincoln	4, 776	1, 358	124, 425 23
Lyon	48, 700	.....	235, 868 14
Nye	11, 664	1, 700	251, 193 54
Ormsby	21, 097	.....	179, 173 19
Storey	94, 138	1, 350	2, 302, 132 68
White Pine	15, 181	261	162, 418 93
Total	274, 337	1, 935	6, 716, 434 27

For the year ending June 30, 1880.

Counties.	Quantity worked.		Gross value.
	Tons.	Pounds.	
Elko	12, 326	460	\$766, 218 98
Esmeralda	29, 440	771	1, 045, 566 07
Eureka	92, 775	706	3, 502, 137 63
Humboldt	18, 606	739	399, 917 82
Lander	5, 842	1, 698	579, 928 75
Lincoln	14, 956	1, 595	408, 281 62
Lyon	63, 068	.....	303, 954 73
Nye	23, 989	1, 165	581, 072 36
Ormsby	66, 713	.....	571, 067 08
Storey	193, 267	600	5, 686, 257 32
White Pine	33, 735	193	511, 239 74
Total	554, 720	1, 933	14, 355, 642 10

CARSON CITY, NEV., *August 28, 1880.*

I, J. F. Hallock, State comptroller of the State of Nevada, do hereby certify that the within and foregoing is a full, true, and correct compilation of the gross yield of the mines in said State for the year ending June 30, 1880, as reported by the county auditors under oath to me, and as appears by their quarterly statements now on file in my office.

Witness my hand and official seal this day and year first above written.

[SEAL.]

J. F. HALLOCK,
State Comptroller.

ARIZONA.

The mining progress of the Territory of Arizona for the fiscal year ended June 30, 1880, and for the six months of the fiscal year 1880-'81 has been most remarkable. The inaccessibility of this region has heretofore been its most prominent drawback. The concentration of capital on the Pacific Coast, so far as mining operations or mining-stock speculations were concerned, almost entirely upon the mines of the Comstock Lode, has also had very much to do with retarding its development. Indian disturbances, especially those connected with the subjugation of the Apaches, tended, of course, to the same end. All these conditions have in the last eighteen months named greatly changed or passed entirely away. The cessation of profitable workings on the Comstock

(as a basis at least for the concentration of nearly all the speculative capital of the Pacific section) has caused a great diversion both of labor and enterprise seeking occupation and opportunity, and of money seeking profitable investment. The Territory of Arizona itself, in its southern half at least, is traversed by a railroad constructed within the calendar year 1880. The Southern Pacific Railroad is now operated from Yuma, on the Rio Colorado, at the western line, to the eastern one near the United States post, Fort Bowie, in Arizona, and the town of Ralston, in New Mexico, a distance of 339 miles within Arizona, of which 325 miles were constructed between February, 1880, and January 1, 1881. This road has opened the river mining districts, made directly accessible those of Pinal and Maricopa Counties, and developed, as to travel and transportation, the whole of Southeastern Arizona. The region has also been made accessible from the east by way of the railroad system of Southwest Kansas, Colorado, and New Mexico. The New Mexican portion of the Atchison, Topeka and Santa Fé system of roads was operated to within less than 100 miles, on January 1, 1881, of the point of junction with the Southern Pacific.

The Apache disorders have for four years past been only sporadic in character and have not greatly hindered prospecting and development within Arizona, though the Victorio raids of 1880 have impeded eastern travel to the Territory in some degree. The largest factor in Arizona development, apart from the direct discoveries of mineral made, always the foremost one, has been in reality the activity of eastern capital and the national interest aroused in mining investments, discoveries, and developments during the past two years.

Arizona is divided into six counties: Apache in the northeast, Maricopa in the center, Mohave in the northwest, Pima in the southeast, Pinal in the center, Yavapai in the north and center, and Yuma in the southwest. Apache County has but little special and present mining interest. Clifton, the seat of the Longfellow copper mines, and some placer ground in the valley of the Rio Francisco, are all that is now known.

The Alta California, San Francisco, gives in an account of the copper mining interests the following in relation to the Longfellow mines, at Clifton:

The Longfellow company's property at Clifton, in the eastern portion of the Territory, has developed quietly into a colossal enterprise. Over six hundred men are employed at the mines; miles of tramway have been built for the more convenient handling of the ores; and a small army of teamsters is engaged in hauling away the bullion and transporting fuel and supplies to the mines. We cannot give the figures as to the amount of production, but the company is working the mines at a handsome profit, and there is no doubt that the aggregate value of the coming year's bullion will be something enormous.

MOHAVE COUNTY.

Mohave County is the seat of the oldest American mining in the Territory. Some California prospectors were operating there during 1854, and some work has continued down to the present day. The principal Mohave mines are located in the Cerbat district, Mineral Park, near Signal, and in the Hualapai Mountains. The McCracken and Signal mines are those that are best known. It is difficult to get a full exhibit of the product of this region, as a considerable amount of work is done under the leasing system and the tributaries carry their small (individually speaking) product to Prescott, Ehrenberg, and Yuma, so that, when disposed of, it figures in other returns. For the fiscal year 1880 the production of Mohave County, as reported, was gold, \$17,350; silver,

\$178,329. For the six months ended December 31, 1880, an estimate based upon the Territorial newspaper reports will be moderate if put at \$120,000, and for the calendar year the total may be stated at, in gold, \$20,000; silver, \$210,000. The larger portion of this product comes from the Signal mill, and one run intermittently on McCracken ore. The Mineral Park mill has also run part of the time.

MARICOPA COUNTY.

Maricopa County has an increasing product to show. Its mines, with the exception of the famous Vulture (gold) and the Tiger (silver), are small at present. The Vulture mill now employs 80 stamps, and its product will be large in the near future. The product for the fiscal year 1879-'80 was as follows: Gold, \$90,072; silver, \$238,119; total, \$328,191. The product of the Tiger mine is stated at but \$17,000, which can be only partial in character. The product for the calendar year may be estimated at, gold, \$120,000; silver, \$280,000; a total of \$400,000.

PINAL COUNTY.

Pinal County contains within its borders the famous Silver King mine, located in the Pioneer district, with several other mines developing about it, and the Globe district, which produces largely in gold and silver, with the Richmond Basin and the Mineral Creek districts, also largely productive.

For the calendar year 1880 the annual report of the Silver King Company shows the following: Gross receipts from sales of ore and bullion, \$505,641.91.

The Mining Record of New York gives the following items of production for the calendar year 1880 from the mines named, to wit:

Silver Nugget, Globe district (silver)	\$19,272
Stonewall Jackson, Globe district (silver)	28,500
Mack Morris, Globe district (silver)	101,966
Golden Eagle, Globe district (gold)	80,000

Total of definite amounts from mines named	229,738
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The Arizona Star of January 1, 1881, gathering its data from the railroad-freight returns of Pinal County bullion shipments being made at Casa Grande Station, Southern Pacific Railroad, gives the following, which include all shipments for the calendar year from the Silver King mine and the mines of Globe:

Concentrations, silver	940,000 pounds.
Silver ore (high grade)	140 tons.
Silver bullion	14 tons.

The Star estimates the concentrations as worth over \$3.75 per pound. This is manifestly an exaggeration, as the Silver King is the only mine concentrating ore and shipping to San Francisco. At one time the concentrations were valued at \$1.00 per pound, and later at but 33 cents. The 14 tons of bullion would be worth \$448,000, and the 140 tons of ore would be fairly estimated at \$150 per ton net (the grade being often quite high), a total of \$21,000. Counting the concentrations at 50 cents per pound, or \$470,000, the total value of bullion and ore shipped to San Francisco from Pinal County would be:

Bullion (silver)	\$448,000
Concentrations	470,000
Ore	21,000
	<hr/> 939,000

And the ore embraced in the above, and excluding the concentrations as being in the Silver King's report, and we have for Pinal County the following production in the calendar year 1880:

Silver King, per company's report.....	\$505, 642
Silver bullion, per railroad freight returns.....	448, 000
Silver ore, per railroad freight returns.....	21, 000
Miscellaneous mines (various sources).....	149, 738
Golden Eagle mill (gold).....	80, 000
Other sources, estimated (gold and silver).....	200, 000
Total 1880	1, 404, 380

The Globe City Chronicle publishes the following about the Globe district:

There are over twenty organized companies in the district, and of these the following have mills: McMorris and Mexican, 10 stamps running; Golden Eagle, 10 stamps, starts this month; Champion, 10 stamps running; Stonewall Jackson, 3 stamps running irregularly; Isabella, 5 stamps, starts again this month; Silver Nugget, 6 stamps running; Townsend, 5 stamps, starts up this month; Silver Era, 5 stamps, under repairs; Miami, 10 stamps, in litigation; Irene, 10 stamps, starts this fall; Mineral Creek, 5 stamps, starts this fall; McMillen, 3 stamps; Wheatfields, 5 stamps. It is the intention to have all of these mills in full running this fall, and as there is in the several mines a large amount of milling ore in sight, the result will be a long and steady output of bullion. There is also a company now being organized to build a narrow-gauge railroad to Salt River (20 miles), and there erect a large mill to run by water-power. The company propose to contract for the large quantities of low-grade ore in sight in our mines and reduce them at from \$9 to \$10.

Since the organization of the district there has been shipped to San Francisco and other places a considerable quantity of very high grade ore. A ton of it was exhibited at San Francisco several years ago which sold for over \$20,000. It is difficult to get on the exact date as to the amount shipped, but from careful estimates we are sure its value was over \$500,000.

From our own knowledge, and after careful inquiry, we find that the total amount of bullion openly shipped from the district up to date is \$460,000, and this is only the beginning. With all our mills going we will start this fall with a monthly bullion production of at least \$25,000.

PIMA COUNTY.

Pima County is the most populous and prosperous portion of the Territory. Its county seat is Tucson, having at the close of 1880 a population of over 60,000. The county embraces the famous Tombstone and Harshaw districts, the Patagonia, Brisbee, San Xavier, Oro, Blanco, Arivaca, Holland, Washton, Dos Cabezas, Dragoon, Washington, and other districts. It includes a large proportion of reduction works, mills, and furnaces, and it produced more than the balance of the Territory during 1880. According to the reports of mining and milling companies and estimates made by the local press, the production as given in the local press was as follows:

	Silver bullion.
The Tombstone mills, January 1 to November 30, 1880	\$806, 249 02
The Tombstone mills (estimated), December 1 to December 31, 1880	107, 194 28
Corbin mill, January to March, 1880*.....	36, 000 00
Contention mill (Western County) silver bullion:	
January 1 to November 30, 1880.....	1, 335, 000 00
December 1 to December 30 (estimated).....	165, 000 00
Boston and Arizona Reduction Works, running July (part of the year).....	46, 624 98
Sunset mill, part of the year.....	22, 500 00
Harshaw mill (Hermosa mine), from August 20 to December 31.....	365, 654 49
Holland smelter (trial runs).....	20, 000 00
Placer gold, Pima County (estimated).....	18, 000 00
From all other sources, as estimated by the Citizen, January 1, 1881.....	100, 000 00
Net yield Copper Queen (copper bullion), for four months ending December 31, 1880	300, 000 00
Total	3, 322, 222 77

* Since March the product has been consolidated with the Gird mill. Both now belong to the Tombstone.

For the fiscal year 1879-'80 the receipts of ore and bullion from Pima County, as reported for this bureau, were as follows: Gold, \$78,813; silver, \$592,061.

The following details are taken from the Citizen, January 1, 1881, a journal published at Tombstone:

The Tombstone Mill and Mining Company submits the following report:

Value of bullion or silver bars produced from January 1 to November 30, 1880.....	\$806,249 02
Value of bullion or silver bars produced from December 1, 1880, to January 1, 1881 (estimated)	107,194 28
Total for the year	913,443 30

Depth of shaft sunk during the year (5 shafts), 1,100 feet.

Drifts—number of feet run during the year, 3,000.

The Corbin mill was sold to the Tombstone Company last March, after a short run, which yielded \$36,000. There has been 150 feet of shafts sunk on mines owned by the Corbin Company, and 100 feet of drifts run. After the transfer above referred to, the yield from the Corbin mill is included in the Tombstone report.

The Boston and Arizona Reduction Works report the shipment of bullion valued at \$46,624.98. This was from 780 tons of ore crushed, and shows an average yield of nearly \$60 per ton.

The Sunset mill, under date of the 17th December, 1880, reported producing ten bars of bullion from a short run, but failed to place a valuation upon the bars. The silver bars produced by the Tombstone mills usually run from \$2,000 to \$2,500. Taking it for granted that the Sunset bars were about the average, or say \$2,250, we have, as the result of the Sunset, \$22,500.

The bullion produced by the Contention mill is estimated at (for nine months) \$1,200,000, as follows:

Value of silver bars produced from April to November 30, 1880.....	\$1,135,000
Estimated value of silver bars produced for the month ending December 31, 1880.....	165,000
Total	1,200,000

Of mines in the most southerly portion of the county, the Citizen has the following:

The Harshaw Company started up on the 20th day of August last; consequently the result following is for but little more than four months.

Value of bullion or silver bars produced from August 20 to November 30, 1880.....	\$275,654 49
Value of bullion or silver bars produced from November 30 to December 31, 1880 (estimated)	90,000 00
Total for the year	365,654 49

The smelter for the Holland mine has not fairly started up, though one or two successful runs have been made. The question of successfully treating these ores is now settled to the satisfaction of all concerned, and regular shipments of bullion will begin with the new year. Value of bullion produced so far, \$20,000.

The Copper Queen (at Bisbee, Mule Pass Mountains) smelter started up the 1st of September last, and, with the exception of three days, has run continually ever since. The daily average yield of copper from this mine is 13,000 pounds, and as the smelter will have been in operation just 120 days, the total yield will be 1,560,000 pounds, which is worth 18 cents per pound in Baltimore, or \$380,000, about \$300,000 of which is net at the smelter.

RECAPITULATION.

Yield of the Tombstone Company's mills.....	\$913,443 30
Yield of the Corbin mill.....	36,000 00
Yield of the Contention mill for nine months.....	1,200,000 00
Yield of the Harshaw mill for four months.....	365,654 49
Net yield of the Copper Queen for four months.....	300,000 00
Yield of the Boston and Arizona reduction works.....	36,624 98
Yield of the Sunset mill (a short run).....	22,500 00

Yield of the Holland (trial runs).....	\$20,000 00
Placer gold produced in Pima County during the year.....	18,000 00

Total value of gold, silver, and copper produced in Pima County for the year ending December 31, 1880..... 2,912,222 77

Amount of silver bars and bullion produced from all other sources, including the Evans mill, the old Ostrich mill, the Derre mill, the Wetherill mill, the San Xavier smelter, and arastras operated within the county..... 100,000 00

Making the grand total produced in Pima County from all sources..... 3,012,222 77

There are six other mills in Pima County now ready to begin operations, and while we deem the above a good showing for what may be considered our first year's operations, we may safely calculate on more than doubling the above amount in the coming year.

The actual yield of the Contention (now known as the Western) mine, as officially reported to the Bulletin by the secretary, D. C. Bates, is \$1,214,055, that being the face value of the bars as shipped. The proportions of gold and silver are as follows:

Gold.....	\$224,448
Silver.....	989,607

Total..... 1,214,055

The Tucson Star of the same date gives the following, which differs somewhat from the above:

The bullion production for mills of the Tombstone Company, Western, Sunset, Boston, and Arizona, in the Tombstone district, and adds that of the Harshaw mill, in the district so named, with scattering sources, making a total of \$2,678,930.55.

To this the Star adds as follows:

The placer gold product is estimated at \$18,000; copper produced by the Copper Queen, 1,700,000 pounds; net values at the mines, \$323,000; making a grand total of \$3,019,530.55 of bullion produced during the year. The T. M. & M. Company and Corbin mill have been in operation since January 1, 1880. The Contention started up in the latter part of April, the Harshaw August 20; the Boston, Sunset, and other mills have run but a short time, and at intervals. The Copper Queen smelter commenced operations August 20. The San Xavier and Holland smelters have been experimenting as to the best method of treatment of ores, and are now prepared to produce good results. * * * There are eleven quartz mills with 164 stamps, four more are under course of construction with a total of 50 stamps, which will be completed during next month, and which, added to the former, gives 214 stamps, and will, in a short time, be working on ore. There are three smelters, with a total smelting capacity of eighty tons per day.

A correspondent of the New York Mining and Engineering Journal, over signature "J. M. G.," writing from Tombstone, Ariz., under date of January 1, 1881, gives the following:

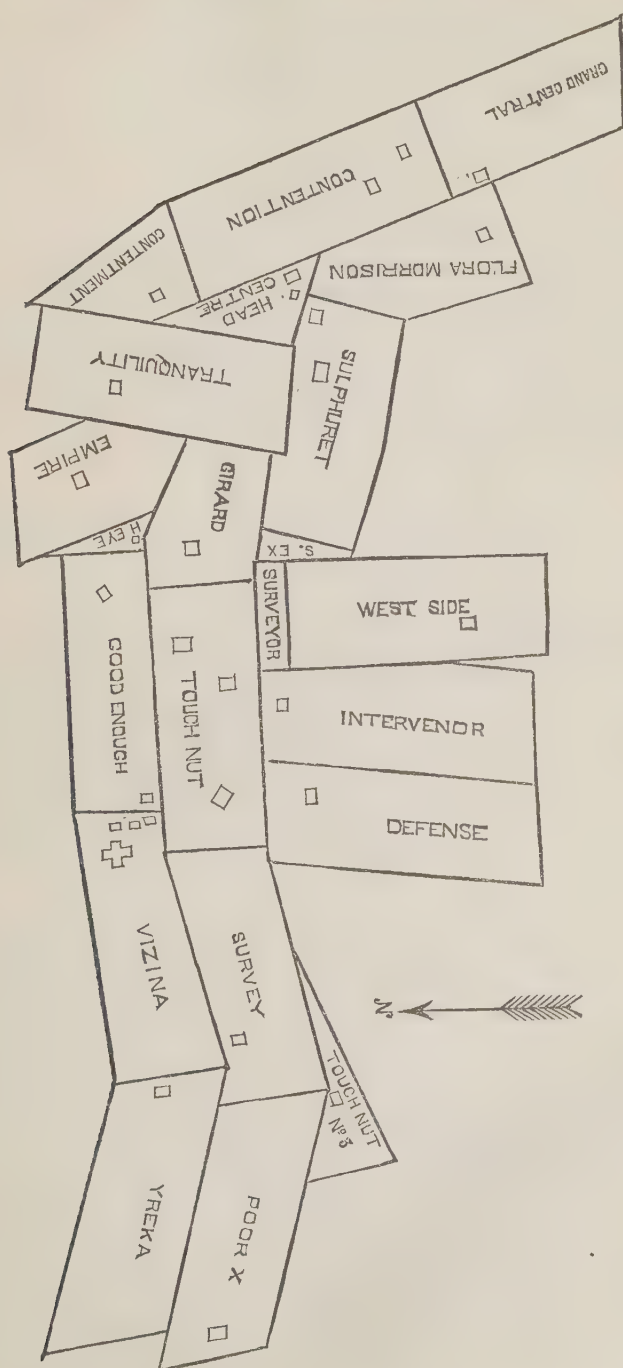
Pima County is the southeast corner of the Territory, with a census population of 19,767, exclusive of Indians on the (Papago) reservation; but the influx of people since last June has greatly increased the above figures. Tucson, with nearly 7,000 inhabitants, is the county seat, and the metropolis of Arizona. Tombstone, the principal mining town, claims a population of 3,500, which is rapidly increasing. Harshaw, La Noria, San Simon, and Bisbee are thriving towns. The completion of the Southern Pacific Railroad through the Territory, also this county, and its speedy connection with the Atchison, Topeka, and Santa Fé, which will be on or before the 15th, has given life to all industries, especially mining. * * * The means of reduction now producing are five stamp-mills and three blast-furnaces, while five or six plants are under construction that will, when completed, double the present capacity.

This correspondent gives the production of the Tombstone Company's mills at the preceding figures. The Boston and Arizona reduction works are reported by him as yielding \$46,625, or \$10,000 above other figures. He adds:

As an evidence of the interest taken in mining in this county, 5,485 mining locations and 1,606 mining deeds were placed on record during the year.

The precise location of such mines as the Empire, Grand Central, Head Center, Toughnut, Good Enough, and Contention are shown by

the accompanying sketch engraved from one recently given by the Epitaph of the leading claims of the Tombstone district.



YAVAPAI COUNTY.

Yavapai County, in which is the Territorial capital, Prescott, shows quite a revival of mining industry. There is little data on which to base returns for the first half of the current fiscal year, but without question the bullion production has largely increased. For the fiscal year 1879-'80 the following returns are made from San Francisco:

Gold.....	\$3,374
Silver.....	251,399
Total.....	254,773

Tip-Top, the largest producer in this county, returns as mill product for the calendar year 1880, \$124,000.

The mining districts around Prescott are those in which the increase of activity and production would most assuredly be first made manifest. The production for the first six months of the current fiscal year will be underestimated, in a round sum, at \$200,000, making a total for the eighteen months under consideration of \$454,773. The last calendar year's product can be safely estimated at \$270,000.

YUMA COUNTY.

Yuma County has recently developed increased activity, especially to the south and east of Yuma City. Castle Downe district, on the Colorado River, and north of the railroad about 30 miles, has yielded in smelting ores shipped to the Selby works at San Francisco, during the calendar year, about \$3,000 monthly, or \$36,000.

Silver district, 50 miles south and east of Fort Yuma, is developing a dozen promising mines, of which the Silent is reported most favorably. A yield of \$50,000 is reported in a local paper, but no authentication has been obtained. For the fiscal year 1879-'80, only \$1,800 in silver bullion is reported. Yuma County may be credited, however, for the calendar year, with a production to be estimated at \$60,000.

Taking, then, the calendar year 1880 and grouping the careful estimates given, the following is the result obtained, in round numbers:

Counties.	Gold.	Silver.	Total.
Maricopa.....	\$100,000	\$280,000	\$380,000
Mohave.....	20,000	210,000	330,000
Pima.....	18,000	3,304,222	3,322,222
Pinal.....	80,000	1,324,379	1,404,379
Yavapai.....	5,000	265,000	270,000
Yuma.....		50,000	50,000
Total.....	223,000	5,433,601	5,656,601

That the foregoing estimates are not extravagant can be seen by the fact that in two counties alone, Pima and Pinal, over seven-tenths of their total production for 1880, amounting in all to at least \$4,726,601, is embraced within the last half of the calendar year. It would be impossible to create so great a local activity as the figures exhibit without all other portions of the Territory feeling it, hence it is certain the estimate is a moderate one. The local press are claiming a total production of at least \$7,000,000. With the progress now made and the increasing rapid development, it is not at all unreasonable to anticipate a total production for the coming fiscal year of from \$8,000,000 to

\$10,000,000. The increase of reduction works is very great. Pima County had on the 1st of January, 1881, eleven quartz mills, with 164 stamps, in operation. It also had three smelting works, with a daily capacity of 70 tons. Several other mills and furnaces were on the point of starting at the date named. By the end of the year the stamp mills and furnaces will be doubled in number and capacity.

Pinal and Maricopa Counties had on the 1st of January, in Pioneer district, one concentrating mill and two others with 30 stamps. The Vulture, Tiger, and the Wickenburg customs mill have 110 stamps in all. Pinal County has in Globe district, at Mineral Creek and Richmond Basin, 13 different mills, dropping in all about 90 stamps; Yavapai County about 45 stamps in operation, and Mohave County 30 stamps, while Yuma is reported as running 20 stamps, making about 490 stamps in all and a half dozen furnaces, besides numerous arrastras. At the end of 1879 there were not over 50 stamps in operation, and not a single furnace running.

The annexed tables give all the figures attainable at San Francisco for 1879-'80.

Summary of bullion production in Arizona for the fiscal year 1879-'80, by counties.

Counties.	Gold.	Silver.	Total.
Maricopa and Pinal	\$90,662	\$266,543	\$357,205
Mohave	17,350	178,329	195,679
Pima	78,813	513,248	592,061
Yavapai	3,374	251,399	254,773
Yuma		1,800	1,800
Unreported sources	190,199	1,211,319	1,401,518
	200,000	800,000	1,000,000
Total	390,199	2,011,319	2,401,518

Two hundred thousand dollars gold and \$800,000 silver are added to this Territory as from unreported sources, to cover the known yield of two mines refusing the information.

Bullion production of some of the mines of Arizona, as reported to and published in the Mining Record, of New York.

Mine.	Calendar year 1879.	January 1 to June 30, 1880.	Fiscal year 1880.	Calendar year 1880.
Contention or Western		\$437,754	\$437,754	\$1,048,986
Head Center		17,000	17,000	17,000
Harshaw				338,000
Hackberry	\$18,008		9,304	
Silver Nugget				19,272
Silver King	283,300	180,000	324,150	454,922
Stonewall Jackson	28,800	4,000	18,400	28,500
Tombstone		268,619	268,619	782,118
Tiger	98,900	17,000	66,450	17,000
Tip-Top	418,800		209,400	124,000
Total	853,408	924,372	1,351,077	2,830,298

OREGON.

Mr. C. G. Yale furnishes the following:

The Oregon mining fields have widened within the past year, or rather they have been more fully developed. Throughout Eastern Oregon, particularly, more extended operations have been undertaken.

It is several years since miners discovered the richness of the Baker County mines,

but work was gradually commenced. The Clark's Creek mines, for instance, now worked by a Chicago company, who own 40 miles of ditches and all the water rights and privileges of the vicinity, lay idle for a long time before being properly opened. Here hydraulic mining is carried on as it is in California.

Both quartz and placer mining in Oregon in 1880 were carried on with satisfactory results; many new discoveries were made in various localities and old mines were put in order for more extended operations.

The Granite Creek quartz mines, Grant County, were those which proved the permanency of quartz mining in the State. The mines there are permanent and extensive. The surface or gravel mines of Rogue River, Poorman's Creek, Galice Creek, Elliott Creek, Rich Gulch, Gall's Creek, Kane's Creek, Clark's Creek, Pocahontas district, &c., all produce their quota of the general aggregate.

The Belmont quartz mine of Heath district and the Virtue mines are the more prominent quartz mines of the State, the Monumental being another. The Connor Creek Company have a 20-stamp mill. The New England and Oregon Mining Company at Page Valley have done well. The Sutton Creek quartz mines promise well.

Although so little silver is shown in the result for the fiscal year, the Oregonian claims that it is now known beyond a peradventure that silver ore exists near Granite and Silver Creeks, in Grant and Baker Counties.

BAKER COUNTY.

Both quartz and placer mining have been pursued during the past season in this county, with satisfactory results. New discoveries of rich ores are reported from many districts, with the complaint in some cases of insufficient capital for their development.

Many of the most hopeful claims have been discovered so recently that no returns of production are possible. A generally contented feeling prevails among miners, as the present yield keeps up the hope of future increase.

The following recent finds are reported: Two new ledges near the Tom Paine mine; several ledges around Rye Valley, of which the Macedonia, a mile and a half distant, is the chief. At the same place, the New England and Oregon Company have made a new discovery. A rich body of silver has been found near Sparta.

The Mammoth mine, near Fort Sumpter, has again begun operations. In the center of a rich belt of gold and silver, it promises well through the enterprise of its managers.

Besides these, the following mines have been located near Baker City: New York Quartz, Baker, St. John. The old Virtue mill and mine are now idle. Among the best paying mines at present are the Connor Creek, Sumpter, Weatherby, Tom Paine, and Monumental Silver.

The mines which have reported are Monumental, Sumpter, Weatherby, Baisley, Never Sweat, New York, Tom Paine, and Monumental (silver). Their production was: Gold, \$226,647; silver, \$400; total, \$227,047.

BENTON COUNTY.

Advices are very meager from this county, and no information of any importance has been received.

But two mines have reported, with a production of \$3,495 gold; \$40 silver; total, \$3,535.

The following from the Dalles Times is of interest:

EASTERN OREGON MINES.—The decadence of the mining interest of Eastern Oregon has been the result of causes which have operated in a like manner in every mineral-bearing State or Territory. As soon as the placer mines have ceased to yield profusely, a period of comparative listlessness has intervened before quartz mines have been opened to any great extent. The rich ledges of Colorado were hardly known until long after California gulch and Gregory diggings had been abandoned, and the same story is to be told of all other mining communities. It will be thus with our own State. While a few men are delving away in two or three mines in Baker

and Grant Counties, there will be little said concerning our mines, but as soon as the wave of capital which is now moving this way reaches us, it will be found that as good investments can be obtained in mining properties as anywhere on the coast. The quartz mines of Baker and Grant Counties are rich in gold and silver, and the Monumental mine, at Granite Creek, has turned out bullion in large quantities for several years. From our location we must wait until every other mining district is opened before receiving our share of attention. Besides the gold and silver mines, Eastern Oregon contains many other minerals which the development of the country will bring to their proper prominence. Coal, iron, and the more useful of the baser metals will some day become fruitful sources of future wealth. Prospecting will show that our mountain ranges contain nearly every mineral known to the world, and thousands of busy hands will, within the next ten years, be found laboring in our mines.

GRANT COUNTY.

No new discoveries are reported, and the opinion prevails that the old mines are worked out.

The mines are falling into the hands of the Chinese, whose production, as reported by Mr. E. Hall, is, gold, \$75,000. We have returns from one mine, gold, \$10,000; silver, \$943; total, \$85,943; of which amount \$75,000 is of Chinese production.

JACKSON COUNTY.

But one mine sends us returns from this county, of gold, \$1,567.

LANE COUNTY.

Two small mines have reported a yield of gold, \$2,726, during the first half of the fiscal year.

UMATILLA COUNTY.

Although discoveries have been reported and a number of mine owners asked for a statement of production, no returns have been received. The mining industry of this county is largely in the hands of the Chinese, and, according to the reports of the agents of Wells, Fargo & Co.'s Express, their production is fully \$51,000, gold.

UNION COUNTY.

Only one mine reports its production, which is \$347 gold. Communications from other mines state that they have only begun operations, "have been washed out," &c.

Early in the year a well-defined quartz ledge, containing galena, silver, and gold, was opened on Pine Creek Mountain. The discovery created great excitement, and numerous claims have since been located.

The Chinese production is said to be, by Mr. T. Hannah, \$60,000, gold; total yield, \$60,347, gold.

The following is extracted from the Oregonian, on Oregon base bullion:

Large bodies of silver-bearing ore exist in the vicinity of Granite and Olive Creeks, in the counties of Grant and Baker, Oregon. The Granite Creek ledges are what is known as "roasting-ore," and the only ledges thus far worked are the Monumental and Beagle, the first being worked by an incorporated company, while the other is in private hands and likely to remain so. The former has an existence of nearly three years, and has combatted many difficulties, the chief of which has been a narrow ledge. But the quality of the ore has always been of the highest grade, and whenever a ledge of over 3 feet in width is struck the Monumental will be good property.

The Beagle is located nearly 3 miles from the Monumental, in the same district and county. It has been thoroughly developed and has a ledge over 3 feet wide. Having no mill of their own and needing a mill to crush some ore to pay their expenses, the brothers Beagle contracted in July last for the crushing and reduction of 200 tons of their ore at the mill of the Monumental Company at the round price of \$30 per ton. The crushing and reduction was not completed till late in November, when the clean up showed a gross yield of \$102.40 per ton, or \$72.40 net profit. This ore has to be first roasted, when the silver comes out in little globules and the rock is very much softened, rendering it easy to crush. The ores on Olive Creek are of an entirely different character from those of Granite, but equally valuable to the State. They are mostly argentiferous galena, the base being lead. Some two years ago a Nevada miner, named Cabell, who had considerable experience in mining this identical character of ores in the vicinity of Eureka and Pioche, came to Baker County and has since done extensive prospecting on the South Fork of Powder River. Out of eleven different locations tried by him, nine show over 40 per cent. of lead. Some of these bodies show as high as \$112 in gold to the ton, while in others the silver preponderates as high as \$128 to the ton. It must be remembered, however, that this is smelting ore and not practically a crushing grade of rock. Hence charcoal furnaces are necessary to its reduction, and by this process much of the gold and silver are liable to be lost by volatilization.

Mining enterprises in this State are of a nomadic character, and with but few fixed mines, which render it impossible to secure full returns of the precious metals from those who take them from the earth.

Summary of bullion production for Oregon, by counties.

Counties.	Gold.	Silver.	Total.
Baker	\$226, 647	\$400	\$227, 047
Benton	3, 495	40	3, 535
Grant	85, 400	543	85, 943
Jackson	1, 567	.....	1, 567
Lane	2, 726	.....	2, 726
Union	60, 347	.....	60, 347
Umatilla	51, 000	.....	51, 000
Unreported sources	431, 182	983	432, 165
	500, 000	.....	500, 000
	931, 182	983	932, 165

Five hundred thousand dollars, gold, is added as from unreported sources, for the reason that Wells, Fargo & Co.'s Express carried from this State during the fiscal year this sum in excess of returns to us.

WASHINGTON TERRITORY.

[Furnished by Mr. C. G. Yale.]

The production of gold and silver of Washington Territory is annually the least of any of the States or Territories which are bullion producers. Yet mining is extensively carried on in Washington, but it is principally for coal. Although prospecting has been extensively done far north of Washington, the immense tracts of land of that Territory have hardly been examined by competent men. There is no good reason why the precious metals may not be found on the Cascade Mountains and the area about Puget Sound, as well as in similar regions both north and south. A certain amount of prospecting has of course been done, but it has not been generally successful. No large quartz mines have been opened up, and no extensive placers, until recently, been struck. These things have no doubt caused an idea to prevail that Washington would never show mines of any value. Still, within the past two years both quartz and placer mines have been found, and those familiar with the country assert that a wide gold-bearing belt undoubtedly exists, crossing the Territory from north to south. In all the rivers flowing into Puget Sound more or less gold is said to be found, but the only one in which it has been found in quantities to warrant much work is the Skagit.

As long ago as 1860 an Indian brought in gold from this river, since which time

every now and then attention would be called to the fact. In 1879 a sort of excitement broke out, and many miners went from Oregon, California, and Nevada to the Skagit mines. The river, which rises in British Columbia, is about 175 miles long, and many smaller streams enter into it. The mining season is very short, and the winter cold severe. The country is wild, rough, and almost inaccessible. Ruby, Cañon, Granite, Eureka, and other creeks showed gold, but the deep snow, long frozen ground, and other difficulties to be overcome, caused in 1880 a virtual abandonment of the claims on the rivers and creeks.

There are mines on the borders of Washington and British Columbia, the ores of which contain silver, but there is so much base metal that they have not paid.

The Negro Creek district mines in Yakima County are being worked, but no mills have yet been brought in. The district is 30 miles square. There are four mines only being worked, the ledges being from 7 to 10 feet wide. Adjoining this district, and on the other side of the range, is the Peshastin district, Yakima County, which has been worked now some seven years. There are only 30 or 40 men at work here, who keep ten arastras supplied with ore, there being no mills. The arastras are run by water power. These mines are all owned by individuals, are worked privately, and are little heard of outside the immediate vicinity.

It is not in the province of this report to make any mention of the coal mines of this Territory, which are, however, very extensive, and supply largely the California and Oregon markets.

PRODUCTION.

[Reported by the superintendent of the mint at San Francisco.]

The isolation of the mining districts in this Territory, and the difficulty of reaching them with provisions and implements, have prevented their development to any extent.

We have returns from only one mine, the Shafer gold and silver, at Ellenburg, Yakima County, at which place there are a number of claims which are said to be of a promising character. Quartz averages \$35 to \$40 per ton, the highest \$70, which are treated entirely with arastras.

In Whatcome County, the heavy snow-fall of last winter has kept the water up until quite recently.

Miners are opening claims on Rugby Creek and its branches with much encouragement; gold and silver quartz are both found here, the silver preponderating, and some \$12,000 in gold have been taken out during the early part of the year.

In Whitman County we are promised good returns for the next report.

Mr. Levi Ankeny, of the First National Bank, Walla Walla, says that the Chinese shipped from Walla Walla, in Walla Walla County, \$180,000, and the whole amount shipped from this point is \$400,000, in gold, without regard to nationality, none of which, however, being produced within the county, but mostly in the mining camps on the tributaries of Columbia and Snake Rivers.

THE SKAGIT MINES.—A wide gold-bearing belt undoubtedly exists, crossing the Territory from north to south, and fine float gold is found the whole length of the Skagit, but thus far it has only been discovered in very few places in paying quantities.

Much prospecting of the Skagit and its tributaries has been done within the past year and previous thereto, and some coarse gold has been struck on Ruby Creek, but the miner labors under great difficulties, and most prospectors, after remaining one season, return more or less disgusted at their want of success in discovering the "rich mines" which they were induced to believe, by reading the glowing but deceptive articles published in various journals, existed on the Skagit River or in the Cascade Mountains.

Yield for the Territory, as reported, gold, \$410,500, which, it is asserted by those who know, is largely of Chinese production.

IDAHO.

Mr. Yale says:

The mining interests of Idaho Territory are again attracting the attention they did some years ago, and this time with better reason than before, since the developments are not confined to one or two localities only. The Owyhee County mines first attracted the attention of "outside" capital to the Territory, and they were for several years the prominent mines of Idaho. In fact, Idaho's mining reputation was made on those mines, a most unfortunate circumstance for her, since on the collapse of many of the schemes such a panic ensued that people would have no more to do with Idaho mines. The history of the Owyhee mines may be said to be the history of the Territory as far as mines are concerned. First came their discovery in 1863; the great ex-

citement and rush in consequence of the finds then made; the organization of dozens and dozens of companies; the extraction of enormous profits on short periods; the richness in gold and silver of the surface ores; the sale of the leading mines, as well as a host of "prospects" to San Francisco capitalists; the listing on the San Francisco Stock Exchange of the stock of these companies, good, bad, and indifferent, with enormous paper capitals; the subsequent fever of speculation in Owyhee stocks, which paid dividends at the beginning of their career; the erection of extravagantly top-heavy hoisting-works on a great number of claims; the mismanagement and heavy defalcations in 1875; the unending and heavy assessments paid by a long-suffering public, and the final collapse of the whole stock-gambling scheme. This sums up the history from the discovery of the mines through the flush period and to the decline. The San Francisco people, to whom until recently miners had to look for capital to develop these mines, became utterly disgusted, and had no confidence in any mine inside the borders of Idaho. It is scarcely necessary to state that this condition of affairs was not the fault of the mines, but of the people who manipulated the stocks. An era of enforced economy succeeded the reign of the unscrupulous managers, and now Eastern capitalists, not having the disagreeable impression upon their minds referred to above, are directing their attention to the Owyhee, as well as other mines of the Territory.

Silver City, the center of this mining industry, with a population of 3,000 to 4,000 at one time, has now about 800, and Fairview, near by, which had 2,500 inhabitants in 1870, has perhaps 100 now. The five principal districts of the county, War Eagle, Mountain (or Fairview), Florida Mountain, Wagontown, South Mountain, and Flint, produced more or less, the War Eagle mines being the heaviest producers. The Poor-man produced the most, about \$3,000,000, and the Oro Fino and Golden Chariot are credited with \$2,000,000 each.

It is worthy of note, in this connection, that most of the rich ore was obtained near the surface. Some ore was found 1,000 feet down, but the best ore was from upper levels. At one time it was possible in this vicinity to buy works that cost \$100,000 for, say, \$2,000. Most of the mines sold under the sheriff's hammer.

This brief history of the principal camps will show why Idaho has not advanced in the ratio she should have done, in view of the fact that she has been so long a mining country. It does not follow, however, that the history is to be repeated. The men who now have the mines are working them more for legitimate purposes than for stock speculations.

The Caribou country is coming into prominence as a quartz center. Gold was known for many years to exist in the cañons running from Caribou Mountain to Snake River. The annual yield of the placers has at one time and another fluctuated considerably. Several quartz veins are now being worked profitably, the veins being very large.

The region of country about the sources of the small fork of the main Salmon River, Wood River, and the southern branch of the Boise River, on being thoroughly prospected showed a number of valuable gold and silver mines. Bay Horse district has a smelter in operation. This district has a great number of mines. The country known as the Wood River and Sawtooth districts is that which is now attracting the greatest attention in Idaho. The Wood River country proper embraces a tract 30 by 75 miles, and over 1,500 claims have been located. The Sawtooth country is sandwiched in between that of Wood River on one side, and the Salmon River country on the other, the latter really embracing the districts of Bonanza and Custer on the Yankee Fork, and Kinnikinick, Poverty Flat, and Bay Horse on the Salmon. A year ago Sawtooth was unknown, the whole region being unexplored. The district lies north of Wood River district, and is now attracting great attention. Yankee Fork has moved ahead; has paid its way from the first. It is said to contain plenty of rich ore, but has few mills or smelters.

The discovery of these various new districts, and the reopening of old mines, coupled with the fact that more attention is now being paid to Idaho mines by outside capitalists, argues well for the mining interests of the Territory. A great deal of ore has been shipped to Salt Lake to be smelted during the past year, and a number of mines are owned by Utah capitalists. Of course, with reduction works nearer home, the ores would pay much better. These must come, as the properties are developed more fully.

Mr. H. L. Dodge furnishes the following details of production by counties:

ADA COUNTY.

Although since 1876 numerous mines have been developed in this county, and a promising amount of gold and silver extracted, the mining interests are second to the agricultural, and of a number of mines reported as producing, only two have given returns for the year, the Rising Sun and the Paymaster.

The production of which was, gold, \$6,090; silver, \$85; total, \$6,175.

ALTURAS COUNTY.

Embraces the great extent of some 20,000 square miles in the southern central portion of the Territory.

Placer mines have been worked with profit for many years, and ledges of gold and silver quartz abound in great richness.

The most prominent feature of mining interest is the presence of great belts of argentiferous galena covering the county from northeast to southwest, which have already been prospected to an extent of 20 to 40 miles in width, and from 120 to 140 miles in length. This range is embraced in the Wood River region, including the districts of Upper Wood River, Warm Spring Creek, and Lower Wood River. This region is unsurpassed for surface prospects and is attracting miners from neighboring States and Territories.

The Wood River Gold and Silver Mining Company, recently formed, expects to ship a large amount of ore in the coming season. It includes the Bullion, Ophir, May Queen, Estella, Evergreen, Highland Chief, Scorpion, Julia, Red Bird, and Emma mines. As there is no smelter in the vicinity of the ores raised by this company, their productions will be shipped to Salt Lake City.

Sixteen new discoveries are reported in Mineral Hill district, fourteen of which are shipping ore at present.

Kinnikinnick district on the northern line of the county, south of the famous Bay Horse district, is remarkable for the high grade of its ores. Great activity prevails here. The Salmon River Mining and Smelting Company, of Omaha, is located at Clayton, at the mouth of the Kinnikinnick, and well-developed mines in the neighborhood of the works are numerous. At a distance of 45 miles on the East Fork are some 25 mines containing strong veins of high-grade ore. These ores are galena, carbonate, and free-milling.

The Snake River, which forms the southern boundary of the county, has always been known to exhibit a good showing of flour gold in its many bars. Owing to imperfect means this fine gold has never been utilized to any extent. By the use of copper plates it can now be taken up, and mining on the Snake River has received a stimulus exhibited in renewed activity. At Salmon Falls, on this river, the Boulder Hill mine, owned by Mr. S. P. Briggs, is producing gold. One of the most successful mines in the county is the Buffalo and Idaho Gold and Silver Mining Company in the vicinity of Atlanta. Mr. W. W. Miller, superintendent, speaks enthusiastically of the prospects of this company.

Two new discoveries here, the Monarch and Tehama, are good producers of both gold and silver, and some good claims are being developed.

The mines which have made reports are, Buffalo and Idaho Gold, Freelon, Monarch, Tehama, Wathen, and White Cloud. Their production, with \$60,000 produced by Chinese, amounted to, gold, \$149,096; silver, 135,274; total, \$284,370.

BOISÉ COUNTY

is especially rich in the number and value of its mines. Placer mining has been pursued with success since the year 1862, and as these mines fail there is every prospect that greater developments will continue to be made in the quartz ledges of its rugged surface.

New discoveries are being made in old mines, producing mines are adding to their force of workmen, and increasing the facilities for operation and many new claims are being located with encouraging prospects.

In Banner district the Elmira Company have now a mill running at full blast and they are taking out rich ore from a shaft in the Big Croppings owned by them. Work is active on the Panamint mine.

On Crooked River, nine miles from Banner, rich silver lodes have been discovered, and in the Walker district a ledge has been found 12 feet wide carrying both gold and silver in good paying quantities.

Two valuable and well-defined ledges in the neighborhood of Centreville show fine prospects, but the lack of capital, and the expense of hauling to a great distance for milling, prevent development for the present.

In Stanley Basin three new and promising discoveries are reported.

At Quartzburg is the Gold Hill mine, one of the most valuable in the Territory.

The mines which have reported are: Elmira Silver, Gold Hill, Ashcroft, North Star, Bazzina, Travis & Channits, Subrosa, White & Kaly, Forest King, Frompton & Martin, Ton Yam, Mammoth, Mountain Chip, Rising Sun, Collins & Corcoran & Co., Paymaster, Elkhorn, Hubbell, Tregay, Yip Kee, Golden Fleece, Bullwhacker, Rabbit Creek, Golando, and Constance. Their production, with \$65,232 produced by Chinese, amounted to, gold, \$765,086; silver, \$104,757; total, \$869,843.

CASSIA COUNTY.

The Snake River separates this county from Alturas and from its northern boundary line. Some of the richest placers of the river are to be found in this county.

Mr. I. W. Wilson, of Black Creek, says that new claims, fine gold bearing bars and placers, are continually opened along Snake River, and worked by white and Chinese labor, with improved fine gold-saving machinery, and the saving of the finest of fine gold brought to perfection.

The mines reporting are Stoley, Bascom, Wilson, Davis & Co., and Boulder Hill. Their production, with \$10,250 produced by Chinese, amounted to \$30,582 gold.

IDAHO COUNTY.

Two new ledges have been discovered this season in the vicinity of Washington; the Tramp by Mr. Charles Johnson, and the President by Mr. Charles Carr. Mr. Willey reports that the placer mines of the Warrens district are mostly in the hands of Chinamen. The district is increasing in its yield of the precious metal.

A prospecting party from Yankee Fork has located a number of claims on the divide of the Payette and Salmon Rivers, in the Middle Fork country, and the reports from this camp are encouraging.

New Placer diggings are reported 15 miles east of John Days Creek, which are creating some excitement at this time.

The yield for this county is, gold, \$414,758; silver, \$100; total, \$414,858; which is the result of Chinese production, with the exception of \$4,863.

LEMHI COUNTY

lies under the Rocky Mountains on the northeast boundary of the Territory. Until recently its mineral wealth has been only occasionally revealed, but within the past year it has displayed some of the largest and richest veins ever opened on the Pacific coast. The principal discoveries lie in the area just north of Kinnikinnick district, in Alturas County. These are comprised in the districts of Yankee Forks, Bay Horse, and Estes Mountain. Bonanza City is the center of a very thriving mining camp. Mines of wonderful richness are being opened in the Custer Mountains; chief of these is the General Custer, which shows an apparently exhaustless vein of gold and silver bearing quartz. Six miles north of Bonanza are the Mount Estes mines. The Montana is one of the richest mines ever opened west of the Rocky Mountains, and will no doubt soon show an astonishing yield.

In Bay Horse district, the Bay Horse Mining and Smelting Company of Omaha have now in operation reduction works, which are smelting the ores of the mines in this and in the neighboring districts, in all for some fifteen or more mines. The prospect of having the ores smelted has put new life into the camps, and new developments are constantly reported.

Many furnaces and arrastras are in operation, and others are in process of construction, affording immediate returns to the miners attracted thither by the exceeding richness of the ledges.

New belts are reported between the Big and Little Smokeys, and between the Pahsiman and the Little Lost River, which are said to be rich in mineral.

At Gibbonville, in the northern part of the county, several arrastras and stamp mills are kept busy with good paying ore, labor is in demand, and the finds are encouraging.

In the vicinity of Challis the following new mines have been located: Mollie, June, and Rambler.

The mines which have reported are: Banner, Ramshorn, Montano, Badger, Continental, Nip and Tuck, Daly Creek Flume Company, Kirtley, North and Southern American, Indian Creek, Freedom, Eureka, Bachelor, and Faithful Boy. Their production amounted to: gold, \$99,291; silver, \$76,010; total, \$175,301.

NEZ PERCÉS COUNTY.

Its resources are principally agricultural. Quartz-bearing ledges promise well in the neighborhood of Moscow, where a new mining camp has been established. The information from this county is very meager, and the production, with the exception of \$1,025, is by the Chinese.

But one mine has reported, the production of which was \$1,025. This, with \$372,000 produced by Chinese, makes a total production of \$373,025.

ONEIDA COUNTY

is the eastern part of the Territory, and the principal mines of precious metals within its borders are the placer mines of the Snake River and the gold and silver mines of the Caribou.

Rich ores are reported in ledges two miles west of Iowa Bar, where five companies are working. The advent of capital with which to develop the mines is eagerly looked for.

Only one mine has reported. Its production was \$4,000. This, with \$37,300 produced by Chinese, made a total production of \$91,300, gold.

A much more favorable report is promised for the fiscal year now on.

OWYHEE COUNTY

in the southwest corner of the Territory, is covered, in its northwest portion, with mountainous ridges showing rich quartz veins, especially in the vicinity of Silver City.

Placer mines are scattered over the county, which are just being worked.

The following new discoveries are reported from Silver City: The Jackson, Decatur, Allison, Webfoot, Last Chance, and Addie Leonard.

The Florida Hill Mining Company is the largest producer in this county. The Rob Roy is said to be a very promising mine.

The mines which have reported are: Bannock, Black Jack, Florida Hill, Tulu, Whiskey Gulch, Freemont, and Last Chance. Their production was: gold, \$59,205; silver, \$128,721; total, \$187,926.

Summary of bullion production for Idaho as reported from the mines.

Counties.	Gold.	Silver.	Total.
Ada	\$6,090	\$85	\$6,175
Alturas	149,096	135,274	284,370
Boisé	765,086	104,757	869,843
Cassia	30,852	.....	30,852
Idaho	414,758	100	414,858
Lemhi	99,291	76,010	175,301
Nez Percés	373,025	.....	373,025
Oncida	91,300	.....	91,300
Owyhee	59,205	128,721	187,926
Total	1,988,703	444,947	2,433,650

MONTANA.

Mr. R. B. Harrison, assayer in charge of the United States assay office at Helena, Montana, to whom was intrusted the collection of statistics of production in Montana, reports as follows:

The past season has been a remarkable one in several respects. The unusual severity of the winter and its long continuance forbade almost all prospecting the past winter. Placer mining, except in a few deep places where drifting is done, was entirely stopped. The usual amount of deep quartz mining was done, and this part of our mining industry is more fully established than ever. Then, too, there was such a slight fall of rain the past spring, the supply of water for placer mines was entirely inadequate for the season. Few miners began working their placers until June 15, and many closed down on the 15th of August, owing to the total failure of their water supply. Many of the smaller mills and arrastras which are dependent upon water for their motive power were compelled to shut down for the same reason. The causes have all tended to lessen the production of gold and silver in the Territory, but I am confident that, for reasons mentioned hereafter, the production is about the same as last year in gold, and possibly more in silver, viz:

Gold	\$2,400,000 00
Silver	2,500,000 00
Total	4,900,000 00

The reasons for placing these figures are from the best and most careful estimates, based on the opinion of careful and well-informed persons, and were only attainable after a long and careful series of inquiries personally made of almost every miner or shipper of gold and silver with whom I have come in contact. Silver mining is prosecuted with more vigor than last year. The increased activity is especially noticed at Butte, the greatest camp of the Territory. Here many improvements and developments have been made. The mines are down to a depth of 750 feet, and show such quantities of ore matter in regularly-defined seams and veins, that all are confident of

their permanency. Scores of valuable mines are sufficiently developed to entitle Butte to the name of the Comstock of Montana.

Philipsburg is in the northern part of Deer Lodge County, about 60 miles from Butte, and is doing well. One large 60-stamp mill has been erected and is now in active and successful operation, turning out considerable silver bullion.

Glendale is also in good order and doing well. The Silver Creek district, of Lewis and Clark County, is also doing nicely. Wickes is again in full blast. These places are our great silver producers, and I place the yield of each as follows:

Butte	\$1,200,000 00
Philipsburg	150,000 00
Glendale	500,000 00
Wickes	100,000 00
Silver Creek	50,000 00

Total 2,000,000 00

Leaving about \$500,000 to be produced from the other silver mines of the Territory. The production of gold during the past year has been largely from the placer mines, more than one-half coming from this source, although the yield from the quartz lodes is each year showing rapid and steady increase, and promises during the next year to equal if not exceed the yield from the placer mines in the numerous gold-producing gulches that abound in Montana. Upon a careful examination I would place the yield from—

Placer mines	\$1,400,000
Quartz lodes	1,000,000

Total 2,400,000

The following is a—

Statement of the production of gold and silver in the Territory of Montana during the fiscal year 1880 by counties.

Counties.	Gold.	Silver.	Total.
Beaverhead	\$150,000	\$600,000	\$750,000
Choteau*			
Custer*			
Deer Lodge	600,000	1,600,000	2,200,000
Gallatin	75,000		75,000
Jefferson	204,000	150,000	350,000
Lewis and Clarke	450,000	100,000	550,000
Madison	475,000	50,000	525,000
Meagher	250,000		250,000
Missoula	200,000		200,000
Aggregate	2,400,000	2,500,000	4,900,000

* Largely occupied by Indians.

The San Francisco Bulletin makes the following statement of the yield of the Butte district for the calendar year 1879:

Mines.	Tons.	Value.
Alice	6,000	\$399,300
Dexter	5,600	241,500
Silver Bow	6,500	288,100
Davis	4,000	150,000
Clipper	2,400	119,000
Thornton	1,200	50,000
Burlington	2,000	70,000
Centennial	1,600	32,600
Colorado and Montana	1,000	100,000
Totals	30,800	1,450,500

About 10 per cent. of the above amount is gold. The Dexter and Silver Bow mills were run mainly on custom work, except 800 tons from the La Plata mine, owned by the Silver Bow people. The other mills were run on ores from mines belonging to their respective owners. The Alice mine has shipped \$840,000 during the twenty-two months that the mill has been in operation. The 400 and 500 foot levels opened in this mine during the past few months are so encouraging that 60 new stamps will be erected in the spring.

UTAH.

Mr. Dooly, without forwarding any detailed statement of the production of different mines, or of the different counties in mining sections of Utah, has furnished a comprehensible and reliable statement of the amount of gold and silver and lead produced by the different smelting works and mills of the Territory and shipped by railroad or express. I have taken the ounces of silver reported by him for the year (calendar) 1880, computed at its coining value, \$4,740,000, and stated that as the approximate silver production for the fiscal year. For gold, as over \$200,000 is reported to have been carried by the Pacific Express Company from Utah during the fiscal year, I have estimated the gold production at \$210,000.

The following is Mr. Dooly's statement of the production for the calendar year:

BASE BULLION.	Pounds lead refined.	Pounds lead unrefined.	Ounces silver.	Ounces gold.
Chicago smelter.....		2,990,861	127,382	357
Germania Smelting and Refining Works.....	2,892,498	1,722,865	162,909	685
Horn Silver Mine (Frisco smelter).....		2,017,991	125,722	550
Horn Silver Mine (H. S. M. Co's smelter).....		6,646,357	463,552	.....
Mingo Furnace Company.....		6,464,382	272,332	675
Morgan smelter.....		2,733,782	157,374	519
Old Telegraph Company.....		4,242,608	119,401	159
Other smelters.....		152,234	4,841	44
	2,892,498	26,971,080	1,434,013	2,989
Deduct base bullion purchased for Germania Refining Works.....		1,360,587	54,218	134
Net product base bullion.....	2,892,498	25,610,493	1,379,795	2,855
Lead, silver, and gold in ores shipped.....		831,600	24,024	23
Total refined lead, ores, and base bullion.....	2,892,498	26,442,093	1,403,819	2,878
DORE BARS.				
Germania Refining Works.....			36,422	116
Ontario Silver Mining Company.....			1,439,542	.....
Tintic Milling and Mining Company.....			41,923	58
Other mills.....			15,798	4,118
Bingham placers.....				850
Silver Reef Mills.....			846,062	.....
Total dore bars.....			2,379,747	5,142

RECAPITULATION.

2,892,498 pounds refined lead, at 5 cents per pound.....	\$144,624 90
26,442,093 pounds unrefined lead, at \$50 per ton, average price for 1880.....	661,052 32
3,783,566 ounces silver, at \$1.10, average price for 1880.....	4,161,922 60
8,020 ounces gold, at \$20.....	160,400 00

Total export value..... 5,127,999 82

The above includes the product of ores received from Idaho, Montana, and Nevada, aggregating 784,450 pounds lead and 120,383 ounces silver. Computing the gold and silver at the mint valuation and lead at its value at the seaboard, it would increase the value of the product to \$6,450,953.70.

The Mining Record, of January 22, 1881, publishes the following information in regard to some of the mines of Utah:

SILVER REEF BULLION.—The total bullion shipments of Silver Reef for the month of December footed up \$82,485.29, making a total shipment for the year 1880 of \$1,086,359.19, and a grand total shipment for the camp of \$3,800,502.96. The wise men

of the schools, who not only declared it improbable that silver could exist in sandstone, but also asserted that it was impossible, can put the above in their pipes and smoke it.—*Silver Reef Miner.*

AMERICAN FORK MINES.—This district is situated in Utah County, on the western slope of the great Wasatch Mountain range, and adjoins Little Cottonwood on the North Snake Creek on the east, and Silver Lake, or Deer Creek, on the west side of the district. The characteristic geological formations of this district are the dolomite, schist, and quartzite of the Lower Silurian and Devonian periods. The same overlie the granite of the Cottonwoods on the eastern flank of the great granite ridge of the Cottonwoods. The Silurian and Devonian limestones overlie the quartzite, from which they are separated by a thin bed of schist 10 to 40 feet in thickness. These limestones appear in beds, and assume the most grotesque forms, ridges, and spires, and represent a mass from 1,000 to 2,000 feet in thickness. In the ravines of American Fork are met everywhere immense boulders of both rock and ore, torn from their virginal bedding by the power and action of the ancient glaciers. Coming across the divide from Cottonwood, observe a fracture in the rock of great extent. On the east side the schists, to a thickness of from 1,000 to 3,000 feet, are predominant; on the west side the younger sandstones prevail. This line of fault can be distinctly traced all along from the divide down the cañon to within the vicinity of Forest City, a distance of about five miles, crossing two divides of mountain ranges. The country on either side of this fault is traversed by numerous fissures and strata veins, which are in turn interrupted and broken through by several extensive porphyry dikes. A great number of these deposits have been opened to a more or less extent, but in not one case beyond a depth of 300 feet, although in the strike some mines have drifted for more than 1,000, and on the Utah Consolidated and Silver Bell property the vein is exposed through various developments over 2,000 feet in length. The reason for the fact that these deposits have not been opened beyond a certain depth is to be found in the extensive dislocations which have found place here through the powerful subterranean forces, and which seem to be entirely foreign to most of the miners of this district. There are two main lines of disturbance in the district, one break running northwest and southeast, carrying the western portion of the lodes upward, and the other break running north and south, diagonally to the first break, throwing the dislocated parts downward. It is very suggestive to connect the dislocations of American Fork with the disturbances which found place during the time of the great upheaval, which are so plainly illustrated in the Cottonwoods and Snake Creek. Here are fine beds of limestone and schist upon the granite, dipping at an angle of from 30 to 40 degrees east, a long distance off from the place from which they were evidently originally torn, which fact demonstrates the idea of the granite underlying American Fork sedimentary rocks.

The ores are free gold, bromide and chloride of silver; carbonate of lead, galena, gray copper, copper glance, and azurites. The principal mines are:

Miller mine property.—Developed by four tunnels, two of which intersect the whole mountain, and over 3,000 feet of stopes, inclines, shafts, drifts, &c. The property consists of the Miller, Wyoming, First West Extension of the Miller, Alpine, Tonto, Tom Green, Sarchfield, Comet, and Sultana mines.

Sunday mine.—Carries free gold ore; value from \$230 to \$21,000 per ton. Developed by one tunnel 250 feet long, another 100 feet long, and an incline over 150 feet deep.

Hidden Treasure.—Ore is bromide of silver. Developments, a tunnel over 200 feet long on the vein and an incline.

Utah Consolidated Mining Company's property.—Developed by the Queen of the West or main tunnel, 300 feet long, which tunnel is bound to tap all the ledges on Miller Hill at a depth of from 300 to 2,000 feet in depth, six other tunnels, in the aggregate over 1,000 feet long, and six shafts. The ore is free gold and carbonate of lead and galena; average value, \$67 per ton. The property comprises the La Belle, Bredemeyer, Meacque, Wacht am Rhein, and Lady Annie mining claims, patented by United States patent, and the Borussia and Cologne mining claims and mill sites.

Excelsior Silver Mining Company's property.—Consists of the Russler and Excelsior mines and mill site. Ore is free gold, carbonate of lead, and galena; average value, \$87 per ton. The property is developed by a shaft 204 feet deep, another shaft 110 feet deep, and a level 60 feet long on the vein. This property contains three lodes.

Bullion.—Developed by tunnels, shafts, and drifts to an extent of over 1,000 feet.

Silver Bell property.—Vein 15 feet wide; value of ore, \$130 per ton. Developed by a shaft and two levels on the main lode, and several shafts, drifts, and cuts on the other mines. The property consists of Silver Bell, North Extension, Mono, Eudora, Red Cloud, Henrietta, and First Chance mines and mill sites.

Bellerophon.—Developed by three tunnels over 600 feet long.

Mary Ellen property.—Vein over 30 feet wide. Developed by an aggregate of 1,600 feet in tunnels, shafts, and levels. The property consists of the Mary Ellen, Live Yankee, and West Extension.

Mayflower and Flora.—Developed by several shafts. Situated southeast of the Silver Bell.

Austin.—Vein 3 to 10 feet of rich milling ore. Developed by four tunnels, two shifts, and several drifts and tunnels, in the aggregate over 1,200 feet in length.

Silver Cloud.—Developed by a shaft over 100 feet deep.

Fairview.—Vein 2 feet wide; developed by an incline shaft over 100 feet deep.

Grand View and Caribou.—Developed by three tunnels and one shaft; ore averages \$100 per ton.

Hudson property.—Developed by numerous tunnels, drifts, and shafts. Comprises the Hudson, Pioneer, and War Eagle mines.

Pittsburg property.—Developed by over 10,000 feet of tunnels, drifts, shafts, stopes, and winzes. Thousands of tons of ore in sight.

Little Cloud.—Developed by a shaft over 100 feet deep.

Wild Dutchman.—Developed by over 12,000 feet of tunnels, drifts, shafts, stopes, and winzes. Has produced steadily thousands of tons of ore since 1872.

Lady Catharina and Rudolph.—Vein, 3 feet of bromide of silver, exposed for over 3,000 feet in length.

Sierra.—Vein 3 feet; character of ore, galena and carbonate of lead; developments over 500 feet in length.

Lost Maid.—Developed by a main tunnel over 200 feet long, two other tunnels each over 200 feet long, and various drifts and stopes.

Gold Seeker.—Developed by a tunnel over 300 feet long, and about 200 feet in shafts and drifts.

Wee Pet.—Developed by a tunnel and shaft.

Orphan and Annie.—Situated on Mineral Flat. Developed a 3-foot vein of solid galena through several shafts and tunnels, all in ore. At present worked under lease by F. Hines.

Besides the above, there are hundreds of valuable mines and properties in the district worked steadily by the hardy miner, but it would take too much space to mention all of them.

The Miller Company own in Forest City a smelter, with two shafts and one roasting-furnace, attached to which are over twenty charcoal kilns in Forest City and Deer Creek.

The Frisco Times states, in regard to the Horn Silver mine, as follows:

The product for this mine foots up a total of \$589,185.40 for the year 1880. There have been no shipments from here the past week on account of the smelter having been closed down. According to Mr. Hill, a force of men are now at work upon the sinking compartment of the shaft, and progress is being made at the rate of 3 feet a day. More drifting is also being done preparatory to taking out the vast quantities of ore that will soon be needed at the furnaces.

Statement of the bullion production of some of the mines of Utah, prepared at the Mint Bureau from tables published by the Mining Record of New York.

Mines.	From January 1 to December 31, 1879.	From January 1 to June 30, 1880.	Fiscal year 1880.*	Calendar year 1880.
Barbee & Walker.....				\$211, 581
Crismon Mammoth.....	\$12, 000		\$6, 000	
Christy Mining and Smelting Company.....	246, 500	\$121, 700	244, 950	272, 100
Horn Silver.....		418, 816	418, 816	463, 816
Leeds.....	114, 436	29, 255	86, 473	29, 255
Ontario.....	1, 352, 486	532, 564	1, 208, 807	1, 622, 444
Stewart.....	80, 100	49, 000	89, 050	51, 300
Stormont.....		275, 500	275, 500	484, 110
Total.....	1, 805, 522	1, 426, 835	2, 329, 596	3, 114, 606

*Computed by adding half the first and second columns.

Utah is doing excellently well, and while there is not now so much excitement about her mines as there was a few years ago, a more healthy tone is manifest. Her principal city is now deriving great benefits from the mines to the northward as well as her own mines. Those who desire to go deeply into the history and statistics of the different districts of Utah had better get one of the immense twelve-page numbers of the Salt

Lake Tribune, issued on the 1st instant. This paper gave an excellent review of the year in Utah, and gave a complete record of each district.

A perusal of the reviews of each mining district will show to the reader two prominent facts. The first is, that among mining countries Utah is entitled to first rank; and second, only preliminary work has been as yet performed. There is not as yet a real deep shaft in the Territory; there are but four or five which are entitled to be considered as anything but prospecting holes. The minerals range through every variety. There are silver, gold, lead, and copper, with all the metals which in any country are found in conjunction with those metals, while the iron deposits of the State are measured by mountains and the coal measures by counties. Of the latter two the supplies are inexhaustible and embrace all varieties. Of the gold, silver, lead, and copper producing districts, many are making revelations which must soon draw a boom. Without slighting the others, Parley's Park, Stockton, Bingham, Tintie, Marysville, and Frisco deserve particular mention, because in these districts the most vigorous work is being performed. Still, there are men who claim that Star district is yet to be the coming camp, and one mine—the Silver Belle—in American Fork, begins to threaten to be the biggest little mine, and not so very little either, in the world. The Ontario, at Parley's Park, is one of the wonders of Utah. Some shrewd men purchased it years ago at a low figure. Since then it has disbursed in dividends \$3,150,000, and now in its lowest workings it is richer than it has been anywhere higher up. General Conner commenced at Stockton upon a little fissure a couple of feet wide; now at a depth of 800 feet he has 24 feet of ore. The last year's work in two or three important mines in Bingham has uncovered ore at a depth which the timid ones were afraid to explore. Enough has been done to show that the annual shipment of bullion from Utah is to increase every year for a generation, if not for generations to come. The peculiar silver sandstone district of Silver Reef, Utah, produced over \$1,100,000 in bullion in 1880.

The Great Basin mine is owned by a stock company, with General P. E. Conner as managing director. This famous mine is situated on Mineral Hill. The average yield per day in this mine is about 25 tons of good merchantable ore, besides about 40 tons of jigging ore, with present facilities for hoisting. This can and will be greatly increased when the large combination shaft is completed, which is now down 80 feet, with its powerful machinery, which is now in progress of erection.

The company has in close proximity concentrating works which are in full blast. Eight tons per day can easily be run through the eight sets of jiggers and concentrated. The supply of water is furnished by a 4-inch galvanized pipe, which is laid for a distance of about six miles. The concentrating works are lighted by two electric lights, which are a great saving in such a large building. Besides the enormous length of 4-inch pipe, there are 8,000 feet of 2½-inch, laid from the springs to the Great Basin Company's boarding-house.

The Great Basin Mining and Smelting Company, of which General P. E. Conner is managing director, have a smelter in Stockton. At present they have one stack in operation, reducing about 25 tons of ore per day; turning out about 5½ tons of bullion, which runs 100 ounces per ton. The company also have concentrating works which reduce about 100 tons of ore per day to 20 tons of concentration by the wet process. This company, which is a Boston incorporation, is an able one, and all the best appliances are being introduced for operating their mines and works.

UTAH BULLION FOR JULY.

We are indebted to our Salt Lake correspondent, Mr. J. C. Young, for the following shipments for July, 1880, from Salt Lake City:

Brooks.....	8 cars.....	\$17,990 50
Morgan.....	13 ".....	23,550 50
Old Telegraph.....	24 ".....	35,480 00
Horn Silver.....	132 ".....	330,550 50
Ontario.....	130 bars.....	190,025 84
Stormont.....	33 ".....	51,269 12
Barbee & Walker.....	15 ".....	22,288 24
Christy.....	9 ".....	16,776 51
Carrie Steele.....	2 ".....	2,361 38
Crismon.....	18 ".....	3,350 00
Tintie.....	6 ".....	3,377 64
Bingham.....	2 ".....	1,450 00
Ophir.....	2 ".....	1,250 00
Total Utah.....		699,720 43
Hillside, Nevada.....		16,513 75
Total shipments.....		716,234 18

SALT LAKE BULLION SHIPMENTS.—The shipments as reported by our correspondent for the month of November are as follows:

Horn Silver	\$120,000 00
Mingo	90,000 00
Germania	49,720 00
Morgan	34,510 00
Hillside	10,731 92
Ore	8,000 00
Ontario	230,799 81
Stormont	35,263 41
Barbee & Walker	12,878 37
Christy	15,037 39
Crismon	13,209 07
Total	620,149 97

In the annual report of John J. Valentine, superintendent of bullion department of Wells, Fargo & Co.'s express, the bullion yield of Utah for 1879 is given at \$5,468,879. In Wells, Fargo & Co.'s statement of the mineral products of Utah for 1879, issued at Salt Lake, the figures are \$5,219,748. This sum is made up as follows, based on average prices of the several products of 1879:

Refined lead, 2,301,276 pounds, at 4½ cents	\$103,557
Crude lead, 26,441,350 pounds, at \$45 per ton	594,931
Silver, 3,835,047 ounces, at \$1.10 per ounce	4,218,552
Gold, 15,932 ounces, at \$19 per ounce	302,708
Total	5,219,748

Included in the above was 6,000 ounces of gold from the Stewart mine, valued at \$123,999. The figures also include 126,000 pounds lead, 102,800 ounces silver, and 200 ounces gold from Idaho, Montana, and Nevada.

The following in relation to the Alice mine is taken from the Salt Lake Tribune:

Near the shaft the croppings rise some feet above the surface, and the ore is rich in silver and will pay well for mining. The shaft-house is provided with two engines and tubular boilers.

The vertical shaft is made in three compartments, one for water and steam pipe columns and the other two for cages to elevate ores and lower machinery and supplies. These two cages are operated by separate engines. The shaft is now down 71½ feet, from which drifts are run at each 100-foot level, where good stations have been provided for the safety and convenience of operating the workings. In working the vein of over 40 feet in width, the ore is found in very solid masses, yet safety demands thorough timbering. The ledge being so wide, stoping is done in sections, and the sinking is being done with a view of placing the mine in the best possible condition for successful workings.

The present force on the mine consists of 100 men under ground and 25 above, and the daily output of ore averages about 75 tons. This ore is divided into four classes which grade about as follows: 1st, sixty-five ounces of silver; 2d, forty ounces of silver; 3d, thirty ounces of silver; 4th, twenty ounces of silver. The first grade is either ran into the mill or dumped, and the second and third grades are placed separately for future reduction, while the fourth grade is thrown into a dump now containing fully 40,000 tons, when cheaper processes are obtained. Of the three first grades large dumps are being stored and will be worked after getting the new mill in operation.

The present mill, in operation the past two years, consists of the complete machinery of a 20-stamp dry-crusher, with all the necessary machinery for working 23 tons of ore per day, which amount it is turning out. The ore is good milling but very hard to crush.

The ore after being dumped from the tramway will pass through two of Blake's largest crushers and fall upon the drying kiln, which is 36 by 80 feet in size, and thence will be thrown into the hoppers of C. P. Stanford's self-feeders. The twelve batteries are set on solid timbers placed on end, and resting on solid masonry 20 feet below the batteries. As each battery contains five stamps it makes this a 60-stamp mill, each weighing 850 pounds, having a drop of 8 inches. From the stamps, conveyors and elevators will transfer the pulverized ore direct to the two reverberatory furnaces, which are of the Howell pattern, the cylinders being 16 inches in diameter and 24 feet long, and supplied with Stedefeldt's auxiliary fire. After proper roasting and cooling, the pulp will be conveyed in cars to the eighteen amalgamating pans, 6 feet in diameter, supplied with nine settling pans each 9 feet in diameter. Three batteries

of boilers supply the motive power, only two of which will be used at one time. Each battery contains two boilers 54 inches in diameter and 16 feet long, supplied with forty-four tubes each. The engine is of the Corliss pattern, non-condensing, and the cylinder is 24 inches in diameter, with 4 feet stroke, and is possessed of 450-horse power.

COLORADO.

The information forwarded through the assayer in charge of the Denver mint in regard to the production of Colorado was so incomplete that the details as to the production of the different mines and localities for this fiscal year had to be gathered from reports published in the newspapers of the State and mining journals.

As nearly all the bullion produced in the State was transported eastward for reduction and refining, it was hoped that accurate information could be obtained from the express companies and railroads, approximating the value of the bullion produced in the State.

As very full investigations of the productions for the last year were probably made under the direction of the Census Bureau and Geological Survey during the examination of the principal producing localities of the State, the omission of detailed description of the mines, obtained through official sources, will be of less consequence. The total production of the State, as ascertained by its shipments, and amounts received at the mints and at refineries and smelting works, was about \$3,200,000 of gold and \$17,000,000 of silver, and the production is steadily on the increase.

The following interesting article on the mining and milling operations of Colorado is from the pen of the Hon. Frank Hall, of Denver :

THE MINES AND MILLS OF COLORADO.

As the first discovery of gold-bearing veins or lodes was made in the county of Gilpin, early in the spring of 1859, and as that section is not only the first in our history, but the most important of the fissure mining districts of the State in point of development, from which the greater part of the progress following took its rise, I shall make it the starting point of this review.

From 1859 to 1869, a period of ten years, for the want of proper knowledge of mining and milling, and of suitable machinery for the reduction of ores and the extraction of the gold from its refractory matrices, very little advance was made beyond the surface opening of the largest and richest veins. The outcroppings, or decompositions, were thrown into sluices and washed, after the manner of placer ground, yielding large returns. After these were exhausted and the pyritous ores reached, the problem of the future confronted the pioneers. In brief, both miners and mill men, being without knowledge of these pursuits, groped in darkness, and the little accomplished was more the result of accident than of any skill employed. In 1867 Prof. (now United States Senator) N. P. Hill solved the problem of treating all the higher grades of sulphuret ores for that district, and for the Territory at large, by the successful establishment of smelting works at Black Hawk, though it was not until two or three years later that the best points of his undertaking began to appear. It may be stated, therefore, that up to the spring of 1870 little or no intelligent development of the mines had occurred.

This enterprise, supported by abundant capital and the best accessories of metallurgical science, furnished the only stable and profitable market the country had known, and at once imparted a stimulus to mining which has continued to the present time. A large number of valuable lodes have been penetrated by shafts and adits to depths ranging from 500 to 1,200 feet. About this time, also, the district received large accessions of skilled miners from the Lake Superior copper mines, from England and Germany, who displaced the inexperienced American labor, and soon resulted in the practical application of the most approved foreign methods of conducting operations under ground. This, followed almost immediately by the connection of our Territory by railways with the great markets of the East, which brought improved appliances in the way of heavy machinery for mines and mills, opened a new era.

In nearly every instance where deep mining has been well and economically directed the most gratifying results have been obtained. The veins generally maintain the

average strength and value of ores found at or near the surface to all depths, and are from 2½ to 10 feet thick between walls, occasionally widening to 15 or 20 feet, but rarely maintaining that strength. About one-eighth of the product representing the pure mineral is carefully assorted and sold to the smelters, the remainder being reduced in stamp-mills and the gold amalgamated. The price of smelting ore ranges from \$40 to \$400 per ton. The milling ore realizes from 2 ounces to 20 ounces gold per cord of 8 tons. In this section all matters connected with mining and milling have been reduced to the lowest attainable stage of economy. Where formerly extravagant waste, negligence of detail, and reckless management were the rule, precipitating numerous failures, rigid systems are now observed and, in consequence, great profits accrue to well-conducted mines.

In the beginning, and for ten years afterward, though meanwhile certain minor improvements were added, the stamp-mills saved only 35 to 40 per cent. of the gold in the ores, a small fraction of the silver (of which all the Gilpin County mineral carries more or less), and none of the copper. Few mines were rich enough to bear this enormous wastage of their valuable metals; consequently few were continuously operated. These mills are now saving from 55 to 65 per cent. of the gold. After the introduction of treatment by fire a general advance was made in all directions.

The history of Gilpin County is, in all essential particulars, the history of every mining district in the State except Leadville. The solution wrought out there has been adopted elsewhere, to the full extent of its application to varying conditions. Each district possesses certain distinctive characteristics peculiar to itself, and while the general principles of mining and extraction are of universal application, there are important differences in the methods of treating the ores. The aid of science is in constant requisition to meet the intricate questions continually arising. The treatment of all classes of ores found in Colorado is a subject which I do not feel authorized to enter upon at great length. It is sufficient to say that methods for extracting the precious metals from all the minerals thus far known have been discovered and are in operation at this time, and when the remote camps are connected with the well-established central markets by railways, an event soon to be accomplished, they will readily yield their riches to them. For details, if required, I respectfully refer you to Senator N. P. Hill, whose knowledge of these matters is very complete.

That the methodical adaptation of the better systems of Germany and England to the opening and development of our mines, strengthened here and there with a few American inventions, has effected great improvements underground, is widely manifest. Our lodes being comparatively narrow, the mineral held in place between substantial, well-defined walls, either perpendicular or slightly inclined, none of the expensive timbering required in the Comstock of Nevada, or other great fissures of the Pacific coast, is necessary. The needs in this direction are very simple and easily supplied; the supports to the walls being heavy logs, which, dampened by the natural humidity of the atmosphere, prevents disastrous conflagrations.

During the past three years, dating from the discovery and extensive opening of the carbonate deposits near Leadville, the greatest activity has prevailed in all departments of mining. While many new fields of enterprise have been discovered and the work of development begun, the older districts have been provided with abundant capital and skilled labor out of the excitement created to place them beyond apprehension of serious disturbance from any financial panic that may occur hereafter, provided silver is retained as money. The field, furthermore, is constantly widening. Since their discovery in 1878 the mines about Leadville have produced in round numbers about \$27,000,000 in gold, silver, and lead. Not one of the mines worked has been exhausted. The time when these deposits will be exhausted is simply a question of the amount of territory which in each claim contains paying mineral. Many new discoveries of valuable ore have been made since the great mines of Fryer Hill began to decline, and while the mineral deposits do not underlie so large an extent of country as was first estimated, explorations by deep shafts have demonstrated that the product will increase rather than diminish for some years in the future.

In Summit County next adjoining Lake on the west, in Park on the east, in Chaffee on the south, and in the vast region known as the "Gunnison," a large number of important revelations have been brought to light by prospectors. Prospectors, however, do not develop mines. This is the work of capital. Some of these discoveries which a year ago were merely favorable "prospects" have been converted by capital into valuable properties. In each of the sections named there are true fissures carrying gold, silver, copper, and lead; horizontal deposits combining like elements and others whose formations are an interesting puzzle to geologists. This is especially true of Breckinridge, Eagle River, and Ten Mile districts. In the Gunnison, lying in close proximity to the gold and silver mines, are enormous veins and deposits of anthracite, equal to the best Pennsylvania, and rich bituminous coals (lignites). As the settlements of that region multiply, these coals will be made to serve all purposes for which fuel is required, and will be especially valuable for the reduction of ores by smelting.

Very few of the lodes and deposits of the Gunnison have been largely opened. The early history of camps in those altitudes is one of incessant struggling to maintain a foothold and of much suffering. The winters are usually long and severe; roads must be constructed, markets established, dwellings erected, supplies brought in, mills and smelters provided, before much can be done in the way of mining. Lines of narrow-gauge railway are now approaching the central points from the east and south, which, when completed, will add new forces to the work. What is beyond, within the lines of the Ute Indian Reservation, is yet to be determined, though sufficient is known to warrant the belief that when the Indian tribes are removed valuable mines will be found there.

The great region known as "the San Juan country" has been occupied for ten years or more. It is known to contain some of the finest gold and silver fissures ever brought to view in the whole Rocky Mountain range. Development has been slow, owing to the length and severity of the winters and to the fact that periodical excitements attending discoveries in more favored localities have taken away large numbers of industrial population. In 1879 large deposits of carbonate of lead, similar in general characteristics to those of Leadville, but of lower grade in silver, were opened at Rico, about 50 miles west of Lake City. Like deposits were found about the same time near Red Cliff on Eagle River in Summit County and near the head of Slate Creek in Gunnison County, but, as at Rico, of low grade in silver, though with a high per cent. of lead. Neither of these beds have been sufficiently developed, however, owing to the brevity of the working seasons, to fully demonstrate their value.

In nearly all the mining counties more or less gold is found, both in the beds of streams or in combination with silver in the fissures, but the only distinctive belt of true gold-bearing lodes now known is in Gilpin County. A small group, less than half a mile in width, having ores very like those of Gilpin, and, so far as tested by milling, of about the same average value, was discovered and partially developed last year in the southwest corner of Gunnison County near Twin Lakes. The ores are easily treated by stamps and amalgamation. Very late in the fall of 1880 there was also discovered on Cochetopa Creek, near the northern boundary of Saguache County, in Gunnison, a considerable belt of gold-bearing fissures, but heavy snows coming on soon afterward nothing more than the surface strength of the lodes and value of the ores was made known. Great hopes are entertained of this region and the present year is likely to develop interesting and important disclosures there.

It is a work of great difficulty to ascertain the exact product of any mining district, but from the best data obtainable at this writing the mines have yielded during the last calendar year about \$24,000,000 in gold, silver, copper, and lead, the latter in the form of crude bullion. After studying the subject very carefully, I believe this to be a just estimate. Of this amount only about three and a quarter millions was gold. If the new gold-bearing districts above mentioned should, in process of extended opening, prove equal to their promise at the surface, a slight increase in the gold product may be expected this year.

In conclusion, it is confidently stated that in all parts of the State where mining is carried on great prosperity prevails. This industry is now in condition to maintain a gradual but certain increase of the precious metals from the yield of the past year. When Leadville, which has been the grand impelling force of the prosperity we now enjoy, shall have been exhausted the development of the older districts which surround that famous locality will more than supply the deficiency. Every season brings to light new treasures. Very much of the mineral-bearing zones is yet unprospected.

One of the greatest evils we have had to contend with in the newer districts is the practice by speculators of bonding favorable "prospects" and placing them in the market at figures far beyond their intrinsic value. In this manner large sections of country have been secured and their development seriously retarded, for when a prospect is bonded the owner generally stops work and waits for his purchase money. All mining schemes, good and bad alike, have been heavily overweighted. Those of known value have been capitalized for millions when there was nothing in the actual showing of mineral to warrant the expectation of continuous dividends or an advance in the value of the stock by honorable procedure. It will take many years to overcome the injury thus inflicted and bring the business of mining to its legitimate plane. Honestly and wisely directed, this pursuit may be made largely profitable, but it seems impossible to reduce it to that basis until speculative operations shall have been wholly or largely eliminated.

LAKE COUNTY.

This county comprises the great silver-producing mines of Leadville, which produce about three-fifths of the entire production of the State, being almost exclusively silver.

As will be seen from the following exhibits taken from Leadville papers, the production of the county for the calendar year 1880 has been in the neighborhood of \$15,000,000. This includes about three and a half millions of dollars' worth of lead, which would leave the production of the precious metals (all silver except \$34,014 gold) about eleven and one-half millions. In this estimate the value of the silver is calculated at about \$1.13½ per ounce fine. Calculating the silver at its coin-ing rate, the estimate would be about as follows: Gold, \$34,014; silver, \$13,110,000; lead, \$3,500,000; total, \$16,644,014.

Product of Leadville for the year 1880.

Months.	Pounds of bullion.	Ounces of silver.	Ounces of gold.	Tons of ore shipped.	Value of silver.	Value of gold.	Value of lead.	Value of ore shipped.	Total for month.
January.....	5,167,429	1,045,356	154	570	\$1,194,509	\$3,080	\$269,546	\$148,900	\$1,616,035
February.....	5,092,719	808,758	169	610	916,292	3,390	292,742	173,181	1,385,605
March.....	5,040,238	743,403	91	1,275	841,916	2,120	293,925	166,132	1,304,093
April.....	4,953,673	636,716	4	925	724,320	80	246,932	109,394	1,080,726
May.....	6,177,660	864,388	4	873	986,164	80	282,737	109,683	1,378,664
June.....	4,227,828	619,489	.....	887	720,281	.....	193,005	126,997	1,040,283
July.....	4,598,738	676,227	300	664	750,367	6,000	206,932	77,885	1,041,184
August.....	6,996,039	769,248	350	1,162	878,989	7,000	349,799	128,391	1,364,179
September.....	7,524,747	848,715	251	2,937	959,027	5,060	375,365	217,147	1,556,599
October.....	6,443,950	757,366	196	1,690	858,365	3,824	298,721	127,453	1,288,463
November.....	5,601,982	625,853	12	817	708,156	240	263,431	68,200	1,040,027
December.....	5,866,851	583,880	157	60	656,783	3,140	262,372	7,000	929,295
Total.....	67,721,856	8,979,399	1,688	12,410	10,195,169	34,014	3,335,507	1,460,363	15,025,153

Production of bullion and shipments of ore were made by firms as follows:

Grant Smelting Company.....	\$4,018,623
La Plata Mining and Smelting Company.....	2,320,183
Billings & Eilers smelter.....	2,105,512
Cummings & Son's smelter.....	1,374,740
Eddy, James & Co., ore shippers.....	1,362,632
Harrison Reduction Works.....	907,456
Ohio and Missouri Smelter.....	818,956
M. E. Smith & Co. (California).....	706,866
Elgin Smelting Works.....	471,147
American Milling and Smelting Company.....	299,103
Malta Smelter.....	89,383
Gage, Hagaman & Co.....	213,697
Little Chief Smelter.....	109,072
Leadville Smelter.....	16,212
Robert E. Lee (shipped to Golden).....	114,096
Taylor-Brunton Stamp Mill.....	62,200
Tabor Milling Company.....	11,275
Colorado Prince Stamp Mill.....	14,000
Oro Stamp Mill.....	10,000
Placer mining (estimated).....	70,000

Total for 1880..... 15,095,153

Against \$10,189,521 shipped during 1879; showing an increase of about 50 per cent. over last year's export.

Mr. Carlyle C. Davis, editor of the Leadville Chronicle, gives the following complete exhibit of the output of the camp during the year. The total output of the camp is estimated in round numbers at \$16,000,000.

From calculations made at the end of each week during the year we find the average output each day to have been as follows:

Week ending—	Tons.	Week ending—	Tons.
January 3, 1880	802½	July 17	639
January 10	692½	July 24	617
January 17	667½	July 31	651½
January 24	667½	August 7	651½
January 31	607½	August 14	783½
February 7	607½	August 21	688½
February 14	530½	August 28	693½
February 21	575½	September 4	708½
February 28	649	September 11	731
March 6	679	September 18	741
March 13	641½	September 25	743
March 20	643	October 2	735
March 27	682½	October 9	745
April 3	765½	October 15	795
April 10	732½	October 23	745
April 17	704½	October 30	792
April 24	749½	November 6	762
May 1	899½	November 13	732
May 8	874½	November 20	736
May 15	854½	November 27	779
May 22	989½	December 4	779
May 29 (strike)		December 11	789
June 5 (strike)		December 18	724
June 12 (strike)		December 25 (estimated)	775
June 19 (strike)		December 31 (estimated)	780
June 26	788		
July 3	756	Total	34, 786
July 10	756		

It will be seen that the largest output was just before the strike, when it came within 10½ tons of four figures. Had it not been for the strike, the output during the first week of June would undoubtedly have exceeded 1,000 tons per day. The average for the year is in excess of 700 tons, and we go into 1881 with a yield of nearer 800 than 700 tons per day. From careful calculations based on reports of output, and bearing in mind that some of the mines work seven days in the week while others only work six, we come to the conclusion that the actual output of Leadville during 1880 did not vary far from 238,000 tons of every grade. Of course we do not include in this the lime rock which the Pendery-Glass is producing or the iron ore which the Amie is producing and selling for purposes of flux.

ITS VALUE.

To ascertain the value of this ore, it is necessary to refer to the bullion returns. At the beginning of the year and for several months afterward it was the custom of the smelters to report to the press their operations in bulk each week. About midsummer they altered their system, and desired to report once a month only. One of the reasons given for this alteration was that the weekly returns were inaccurate, and that they led to errors in computing the bullion output of the camp. Assuming the returns since made to have been accurate, the amount of

BULLION PRODUCED

by all the Leadville smelters during the year 1880 was as follows:

January to June	\$7, 813, 866
July	1, 054, 439
August	1, 296, 372
September	1, 502, 085
October	1, 339, 169
November	1, 032, 026
December (estimated)	1, 250, 000
Total for the year	15, 287, 927

If, as above stated, the ore product of the year was 238,000 tons, and the smelters' product, as above, \$15,287,927, the average value of the ore produced during the year 1880 must have been \$61.68, a higher average grade of ore than has been produced in

any western camp. But in fact about a million dollars' worth of ore were produced which never went to the smelters.

The following condensed report, taken from the Leadville Chronicle, gives the production of the county for the fifteen months ending April 1, 1880, and also for the calendar year 1879, by mines:

The product of the Carbonate Camp for the fifteen months ending April 1 is as follows:

Mine.	Pounds of bullion.	Value.
Little Chief.....	1, 236, 061	\$301, 920 08
Ohio and Missouri.....	1, 549, 677	259, 130 76
Cummings & Finn.....	2, 785, 500	558, 873 00
Gage-Hagaman.....	1, 115, 696	276, 353 60
Raymon, S. & McK.....	693, 000	160, 454 84
Elgin.....	2, 415, 294	543, 622 04
Harrison.....	4, 862, 740	1, 085, 541 76
Grant.....	13, 493, 000	3, 481, 032 24
Leadville.....	985, 803	218, 665 66
La Plata.....	9, 042, 332	2, 508, 575 72
American.....	1, 747, 471	307, 251 52
Billing & Eilers.....	7, 141, 530	1, 404, 349 44
California.....	908, 360	192, 055 16
Dickson & Co.....	3, 837, 155	850, 084 16
Steen & Co.....	256, 736	62, 560 76
Adelaide.....	344, 000	75, 225 96
Total from smelters.....		12, 285, 676 70

Yield from placers, 1879.....	\$30, 000 00
Eddy, James & Co., ore shipments.....	1, 247, 977 31
A. R. Meyer & Co., ore shipments.....	500, 000 00
R. E. Lee mine, ore shipments.....	32, 850 00
Other ore shipments.....	1, 600, 000 00
Ore on the dump.....	1, 000, 000 00

Grand total, fifteen months..... 16, 696, 504 01

The product for the first three months of 1880 has been as follows:

Name of smelter.	Value of silver.	Value of lead.	Total value of product.
Little Chief.....	\$80, 721 78	\$8, 243 94	\$89, 144 20
Ohio and Missouri.....	82, 022 08	22, 246 16	104, 268 24
Cummings & Finn.....	190, 482 88	45, 359 88	215, 833 76
Gage-Hagaman.....	115, 810 68	20, 692 60	136, 503 28
Elgin.....	87, 973 76	30, 397 08	118, 370 84
Harrison.....	224, 089 60	30, 364 08	263, 453 68
Grant.....	906, 189 76	177, 368 00	1, 083, 557 76
Leadville.....	16, 400 16	3, 087 60	19, 487 76
La Plata.....	441, 386 40	97, 553 08	538, 939 48
American.....	64, 293 60	19, 120 56	83, 414 16
Billing & Eilers.....	292, 979 68	88, 699 60	381, 679 28
California.....	90, 044 64	22, 240 52	112, 285 16
J. D. Dickson & Co.....	57, 649 76	7, 424 00	65, 073 76
Ore shipped east.....			528, 947 55
13 smelters, 35 stacks.....	2, 650, 044 78	572, 788 16	3, 740, 958 91

The estimate which I have given in this report of the production of Lake County for the fiscal year 1880 was based largely upon the above statements. The estimate was:

Gold.....	\$74, 000
Silver.....	11, 750, 000
Total.....	11, 824, 000

The following statements of the production of the mines of Leadville for the months of July, August, September, October, and November, 1880, are taken from the Mining Record:

LEADVILLE SHIPMENTS FOR JULY.

Grant Smelting Company.....	\$396,699
Eddy, James & Co.....	55,639
La Plata Mining & Smelting Company.....	159,545
Billings & Eilers.....	63,366
California Smelter.....	18,221
Ohio and Missouri.....	84,622
Cummings & Finn.....	80,755
Elgin Mining and Smelting Company.....	47,776
Harrison Reduction Works.....	119,348
Robert E. Lee mine.....	22,468
Colorado Prince Mill.....	6,000
Total.....	1,054,439

There were on hand at the various smelters on the 1st of July 11,302 bars of bullion, while on the 1st of August the accumulation was 21,083 bars, thus showing an increase of amount on hand amounting to 9,781 bars, or about 490 tons. This added to the amount of shipments would show the amount produced, and makes a very fair month's business.—*Leadville Herald, August 4.*

The Leadville bullion product for October, says the Democrat, though slightly below the September returns in point of value, does not reflect disparagingly on Leadville for several reasons. In casting up the aggregate value of the product lead was figured at only 4½ cents, while last month the state of the lead market warranted us in placing lead at 5 cents a pound. The price of silver has also greatly decreased in the past two weeks. The bullion shipped during the past month was all produced, while the shipments of the previous month were largely increased by several smelters that shipped their stock on hand. Taken in the aggregate, the business of the smelters for the last thirty days has been of a very healthy nature, and one that cannot claim credit for work previously done, or detract from the products of the ensuing month. The Elgin smelter had been in operation but a few days, producing very little, and no shipments were reported. By referring to the summary it will be seen that the product for October amounted to \$1,344,355.

The smelters of Leadville are now well supplied with ore, embracing every grade and class, and their prospects are truly flattering. The amount of ore on hand has in almost every instance been increased during the past month, and it will require the addition of several more furnaces than have been in blast during the past thirty days to treat the ore that will be produced during November. To meet the wants of our mines the two furnaces in the Malta smelter were blown in on the 1st instant. The Elgin smelter, which has been lying idle nearly the entire month, has secured an abundance of ore, and has one furnace in operation again. There are now twenty-seven stocks in blast in this camp, and preparations are being made to blow in two of the five remaining furnaces. The grades of ore treated recently have run very high in lead, which has a tendency to reduce the assay value of the bullion, and requiring a much larger product to obtain increased results.

Summary of bullion shipments for the month of October we make as follows:

	Silver.	Lead.	Total.
The Grant Smelting Company.....	\$195,493	\$75,744	\$271,237
Eddy, James & Co., 169 tons of ore shipped.....	127,454		127,454
La Plata Mining and Smelting Company.....	162,535	41,832	204,367
Billings & Eilers.....	193,980	79,920	273,900
Chicago Reduction Works.....	106,061	40,425	146,486
Leadville Gold and Silver Amalgamating Works (Taylor & Burnton).....	13,600		13,600
Ohio and Missouri Smelter.....	52,773	14,945	67,716
Cummings & Finn, gold, \$2,686.....	84,126	22,081	106,893
Harrison Reduction Works, gold, \$900.....	49,464	23,967	74,331
Total October shipments.....			1,287,984
Cummings & Finn's works in part omitted September report.....			51,184
Value of shipments not previously reported.....			1,839,168

The bullion product of Leadville for the month of September compares as follows with that of previous months:

July	\$1, 054, 439
August	1, 296, 352
September	1, 502, 085
Increase of August over July	242, 913
Increase of September over August	205, 733
Increase of September over July	448, 646

The product of the camp for the first three quarters of the calendar year is \$11,666,742 as against \$10,630,000 for the whole of 1879. Of the bullion product for September, \$1,502,085, considerably over one-third, or \$588,631, were produced by Messrs. Billings & Eilers and the Oro La Plata Smelting Company, and as Billings & Eilers blew in a new furnace this week their product will be still larger next month. Messrs. Mather & Geist, of Pueblo, are about to establish a special agency here for the purchase of ores, and their consumption of Leadville ore will probably increase hereafter.—*Leadville Circular, October 9.*

Leadville bullion shipments for November are reported by the Democrat as follows:

SUMMARY.

Cummings & Finn	\$124, 000 48
Ohio and Missouri	77, 737 54
Elgin	49, 598 48
J. B. Grant & Co	273, 164 70
La Plata	161, 587 50
Billings & Eilers	157, 699 09
Harrison Reduction Works	12, 299 00
Smith & Co.	69, 316 76
Malta	10, 862 96
Taylor & Brunton	25, 200 00
Eddy & James	43, 269 00
Robert E. Lee	25, 000 00
Total	1, 030, 293 42

RECAPITULATION.

Pounds of bullion shipped	5, 601, 982
Pounds of ore shipped	316
Ounces of gold reported in shipment	11½
Ounces of silver in shipment	625, 853
Value of silver	\$708, 158 37
Value of gold	953 00
Value of lead	263, 441 06
Value of ore	68, 200 00

The Mining Record for January, 1881, publishes the amount of ore on hand at the various works, and paid for on January 1, 1881, as follows:

	Tons.
Billings & Eilers	2, 500
La Plata	1, 000
Cummings & Finn	2, 000
Eddy, James & Co	2, 450
Grant Smelting Company	11, 000
Aug. R. Meyer & Co	4, 000
M. E. Smith & Co	300
American smelter	500

Total amount on hand

23, 750

Against 10,000 tons on hand December 31, 1879, showing an increase of 13,750 tons.

The Rocky Mountain Mining Review states the product of the Leadville mining district, from the date of early placer mining, to be as follows:

1860-1873, gold from placers	\$6, 400, 000
1874, gold and silver	145, 000
1875, gold and silver	113, 000

1876, gold, silver, and lead.....	\$85, 200
1877, gold, silver, and lead.....	555, 330
1878, gold, silver, and lead.....	3, 152, 925
1879, gold, silver, and lead.....	10, 189, 521
1880, gold, silver, and lead.....	15, 095, 153
Total up to 1881.....	35, 736, 129

The Democrat publishes a list of the dividends paid up to January, 1881, by sixteen mines, viz:

Amie.....	\$305, 000
American Consolidated.....	90, 000
Breece Iron.....	20, 000
Chrysolite.....	1, 100, 000
Climax.....	180, 000
Catalpa.....	60, 000
Dunkin.....	105, 200
Evening Star.....	125, 000
Hibernia.....	100, 000
Little Chief.....	700, 000
La Plata.....	250, 000
Leadville.....	150, 000
Little Pittsburg.....	1, 350, 000
Morning Star.....	240, 000
Robinson Consolidated.....	250, 000
Robert E. Lee.....	1, 200, 000
Total.....	6, 225, 200

It is said that these and other Leadville mines had previously divided among their owners \$5,697,300 in profits.

As some account of the great producing mines of this wonderfully argentiferous country may prove interesting, the following descriptions of Leadville and its mines, taken from the Colorado papers, are given:

The property that first gave exceeding importance to Leadville, and the production from which created a furore of excitement over this section of country, was the Little Pittsburg. In fact, but a short time elapsed after its first working till the name of Little Pittsburg became as familiar to every one in the State, and to most of the people East and West, as did that of Leadville itself.

A notice of the past history of this well-known property is not proposed here, but for a year past it has so completely dropped out of sight and has occupied so little of the attention of the public that a brief reference to the past is deemed advisable.

The property of the consolidation consists of about fifty acres, located mostly on Fryer Hill, and portions of the claims being in the very heart of the carbonate belt. When, in the early history of the company, the immense deposits found in the New Discovery, Little Pittsburg, and Winnemuc claims were developed, it is no wonder that the value of the ore deposits was estimated at many millions of dollars. The known developments had exposed so much, and the unknown, undeveloped ground beyond gave so great promise, it was difficult to conjecture what might be the possibilities of the future.

It is now nearly a year since the failure of the Little Pittsburg Company was announced. From the first discovery of the property till February, 1880, the different claims had yielded a gross amount of over \$4,000,000, and during the ten months of the existence of the company, a profit of \$1,050,000 had been divided in dividends. Since that time, however, the developments apparently showed but little, and the mine has gradually fallen in the estimation of the public till it has attracted but little attention, and the production had become so little that those most sanguine regarding the property began to lose faith. From the old workings in different places a little ore has been taken out, and new drifts started have at times encountered small deposits of ore, but no great strike was made for a long time.

Since Mr. F. E. Conda, the present manager, took charge of the property, he has devoted his time and attention principally to exploration and to taking out the ore left in the old workings. That he has made some production is shown from the fact that during the last seven months of the year 1880 the ore produced brought a net value of \$111,270. In the month of January there were shipped 524 tons, of which 491 tons were settled for.

Yesterday the Herald reporter visited the mine and was shown through. The No. 6 shaft is 250 feet in depth and is still being sunk. The main level extends at 210 feet

deep. There are two Knowles pumps used to keep the water from the mine, the lower one pumping to the level and the other forcing to the surface. At 210 feet in depth a station is put in and a drift extends first to the northwest, a distance of 130 feet. This is to within 12 feet of the line of the Little Chief company. Here the drift turns to the south, bearing east, and extends for 60 feet, where an upraise is made of 24 feet. From the top of this upraise the drift continues a little east from south for about 50 feet, at the end of which an upraise of 25 feet was made. This point is about 85 feet east of the Little Chief line. This upraise has cut an ore body fully 10 feet in thickness. Thirty feet back in the drift another upraise is made, which shows an equal body, while near the first upraise, or 50 feet from where the first ore was struck, an upraise has been started which is already 3 feet in ore, and the ore body showing strong in the roof. There can therefore be no doubt of the importance of the strike, or the fact that the ore body is of exceeding extent. Although the ore body is therefore nearly 50 feet above the level run from the shaft and is about 160 feet below the surface, it is still 40 feet below the former workings in the Pittsburg and New Discovery to the south. The trend of the ore is to the east, slightly pitching to the north, and although 320 feet from the line of the Amie, it adds much to the prospective value of the north end of the Amie, Climax, and other properties to the east on Fryer Hill.

From the No. 6 shaft there is also a drift running to the east a distance of 85 feet, which shows in its face a fine body of iron. An upraise is to be made from this, hoping to find the same ore body above found in the west. When the shaft was struck a good contact was cut, but as at that immediate point it was low grade in silver. In addition to the No. 6 shaft, yesterday the reporter also visited the other workings. In the No. 1 New Discovery considerable ore is being mined. This is found mostly to the east from the main north level and near the Little Chief line. There is also considerable to the north, near the Carboniferous line. In many places in the old workings the ore was not all taken out and it is found both under and above the timbers. This is now being carefully prospected, and, where thought advisable, the old timbers are removed, the ore taken out and the mine is retimbered. From 20 tons upward per day has been recently taken from this portion of the property. The No. 2 shaft, Pittsburg, is also being worked, and is producing considerable iron rich in chloride. In January there were 53 tons of ore shipped from the shaft that netted over \$5,200. Work is also being prosecuted from the No. 4, Pittsburg, but this has been connected with the No. 6 shaft.

In about a week work is to be started up on No. 6 Discovery shaft, which is located to the south on Yankee Hill. The shaft is now 250 feet deep, and has complete hoisting works.

THE EVENING STAR.

The performance of this mine during the year 1880 was very erratic. Ore was found in the mine in 1879, and Mr. W. S. Ward, the manager, began to ship in the last half of that year. In January, 1880, shipments of about 20 tons a day were reported. In the latter part of January these shipments appear to have fallen off, the hard carbonates seeming to run so high in silica that the smelters were unwilling to pay a price which the mine owners deemed satisfactory. In the middle of March shipments of moderate amounts, 15 to 20 tons per day, seemed to have been resumed, and carried on for several weeks. Shortly before midsummer the manager came to the conclusion that it was to the interest of the company to suspend shipments until a main shaft was sunk, through which all the ore could be extracted from the various levels. It was not till September, according to Mr. Ward's reports, that active shipments were resumed. They then became quite large. The main shaft completed, the ore bodies could be successfully attacked, and from 30 to 60 tons a day of good merchantable ore were regularly extracted. At the present time the output is reported at 60 tons per day.

THE CARBONATE HILL COMPANY.

This is the old Yankee Doodle mine. At the beginning of the year it passed into the hands of O. H. Harker. A deep shaft was sunk, and drifts run in the direction of the known ore bodies. Thus far these operations have met with practical success.

THE LITTLE GIANT.

At the beginning of last year the Little Giant was outputting a moderate quantity of ore of very good grade. It has continued to do so throughout the year.

THE MORNING STAR.

In the beginning of 1880 the Morning Star reported its output at about 40 tons of ore per day. The output of the mine reached 65 tons in September, then fell back to 50 tons, but promises to reach 100 tons when the drifts are opened next spring.

THE DUNKIN.

The Dunkin mine was purchased in April, 1879. Mining operations were commenced at once, and mineral was soon struck. The mine is now in excellent condition, and prospecting is being actively and economically carried on. The mine is one of the best in the camp.

THE IRON MINE.

In January, 1880, the Iron mine was outputting about 50 tons per day. Except the rock ore, which ran high in lead, the output was generally of pretty good grade in silver. In the latter part of January a cave in the works reduced the output, and when this was repaired, the owners, becoming dissatisfied with the prices obtained for ore, withdrew theirs from market, and only shipped what was on the dumps. About the middle of March Winfield S. Keyes was placed in charge of the mine by the new company, and proceeded at once to carry out a system of exterior improvements. He started a tunnel of two compartments considerably north of the main incline, and timbered it in the most substantial and expensive manner. When he took charge the output was about 30 tons. From this it rose to 180 tons just before the strike. After the strike the output began at 150 tons, and though there were occasional weeks when it rose even to 250 tons, it has not averaged over 150 since the strike collapsed in the last week of June.

In the second week of July Mr. Keyes resigned, and Mr. W. H. Stevens resumed the management of the mine. The output continues to be about 150 tons per day, but will be increased next year.

FRYER HILL.

Crossing the gulch and ascending the slopes of Fryer Hill, the group of buildings which indicate the Little Pittsburg, the Chrysolite, and the Little Chief, first strike the eye. The Chrysolite, which began the year with an output of 125 tons of high-grade ore, and reached an average of 170 tons just before the strike, fell back to 75 tons in the third week of July, and has never since reached that figure. When the fire was successfully shut out from the north Chrysolite workings an output of 50 tons a day of very good ore was resumed. The Little Chief began the year with an output of about 100 tons. This ran on without material change until the middle of May, when George Daly's works being nearly completed, he increased his yield to 160 tons, which was the figure when the strike closed down the mine. Towards the middle of July the output fell off to 100 tons, and gradually declined to 50 tons in September. The output was suspended during the fire, but the mine has since yielded a fair amount of good ore.

THE HIBERNIA.

This is one of this year's strikes, the ore having been found late in the summer. It is outputting 10 or 12 tons a day, and some of it is reported as very good indeed.

THE COLORADO PRINCE, AND OTHERS.

At the beginning of the year there was a small but regular output from the Colorado Prince, and occasional shipments of ore were made from the Black Prince and Miner Boy. Owing to financial difficulties the three companies were compelled to suspend work in the course of the summer.

THE HIGHLAND CHIEF.

Early in the year, owing to imperfect sorting, the Highland Chief shipped to smelters a large quantity of very low grade ore, which carried an undue proportion of silver. The mine lay idle for a large part of the summer. In the fall it was started up again, and an output of 65 tons was reported.

THE MATCHLESS.

This new property of Governor Tabor's began to ship ore to the market in the latter half of 1880, and has since continued a regular shipper.

THE ROBERT E. LEE.

At the beginning of 1880 the Robert E. Lee was not a large shipper. Probably 20 tons was its average. Early in the spring, Mr. Loomis, the manager, undertook the construction of crushing-works, which hardly fulfilled the expectations of their con-

structor. On Mr. Loomis's resignation his successor, Mr. Irving Howbert, remodeled the works, and, considerable progress having been made in the development of the mine, increased the output to 45 or 50 tons.

THE AMIE AND CLIMAX.

These two mines have varied materially in their production during the year. Rich pockets have been found in both, which have been succeeded by bare streaks. At times his output reached fifty tons of ore per day, of very good grade. Since the output is believed to have been less in quantity and lower in grade. The Climax has been very erratic in its performance, sometimes outputting considerable quantities of fine ore, and then again running into almost barren iron.

The following table, taken from the Rocky Mountain Mining Review, shows approximately the present daily output of the leading mines of Leadville:

Mines.	Tons.	Mines.	Tons.
Scooper.....	5	Virginus.....	5
Florence.....	8	Half-way House.....	12
Little Johnnie.....	10	Evening Star.....	25
Colorado Prince.....	10	Dunkin.....	15
Carbonate Hill.....	5	Robert E. Lee.....	.....
Henrietta.....	10	Silver Wave.....	20
Little Pittsburg.....	17	Little Giant.....	5
Chrysolite.....	16	Crescent and Etma.....	10
Little Chief.....	30	Highland Chief.....	15
Iron Mine.....	150	Comstock.....	5
Silver Cord.....	25	Matchless.....	.....
Catalpa.....	15	Hibernia.....	10
Fryer Hill.....	10	Climax.....	20
Amie.....	.....	Great Hopes.....	10
Oro La Plata.....	30	Dyer.....	6
Glass-Pendery.....	12	Others, say altogether.....	30
Morning Star.....	40		
Little Ella.....	12	Total tons.....	620
Argentine.....	15		

GILPIN COUNTY.

The mines of this county produce over two-thirds of all the gold product of Colorado. The estimate which I have given of the production of this county during the fiscal year 1880 is: Gold, \$2,320,000; silver, \$300,000; total, \$2,620,000, being an increase over the production for 1879.

Below is given a tabulated statement, taken from a Central City paper, of the production for the calendar year 1880, showing the shipments by express and the amounts handled by smelting-works. In this statement is included the value of the lead and copper extracted from the ores, but the silver is calculated at its market price, about 1.13,5 per ounce, while its actual value in coin would be some \$40,000 greater.

The shipments made through the Union Express office in this city are as follows, showing the totals for each month during 1880:

January.....	\$125,000 00
February.....	107,600 00
March.....	110,300 00
April.....	150,500 00
May.....	73,700 00
June.....	108,100 00
July.....	81,400 00
August.....	86,700 00
September.....	134,500 00
October.....	95,100 00
November.....	90,950 00
December.....	100,500 00
Total.....	\$1,264,350 00

PRODUCTION.

Boston and Colorado Works.....	\$689,000 00
Golden Smelting Works.....	100,693 37
Moore Smelting Works.....	151,047 12
Omaha Works.....	100,000 00
Pueblo Smelting Works.....	150,000 00
French Works.....	100,000 00
Malachite Works.....	25,000 00
Bank shipments, through express.....	1,264,350 00
Other sources.....	100,000 00
Total for year.....	2,680,090 49
Product of 1879.....	2,431,291 00
Increase of 1880 over 1879.....	248,799 49

The total product of the above shows quite an increase over the former year. When the fact is taken into consideration that the new mining camps to the west and southwest of Gilpin County drew largely upon our population during the spring and summer months, the above gives a very flattering showing.

Below is a list taken from the Mining Record of February 12, 1881, of the stamp-mills in Gilpin County and stamps in operation:

	Total number of stamps.	Stamps in ope- ration.
Waterman, Eureka Gulch.....	20	20
Mackey, Nevadaville.....	37	37
Consolidated Kansas, Nevadaville.....	52	40
Whitcomb Mill Company.....	25	25
Kip & Buell, Central.....	60	0
United Gregory, Central.....	50	25
New York and Colorado Company, Central.....	40	40
Bobtail Mining Company, Black Hawk.....	125	125
Empire Mining Company, Black Hawk.....	25	25
Kimber Mining Company, Black Hawk.....	35	35
Bostwick Mining Company, Black Hawk.....	25	0
Fullerton Mining Company, Black Hawk.....	77	40
Midas Mining Company, Black Hawk.....	20	20
Hidden Treasure.....	20	20
Arrighi.....	15	0
Wheeler.....	20	0
Tomlinson.....	32	0
Gregory.....	50	0
New York.....	75	25
Randolph.....	50	50
Cashier.....	35	25
Rollins.....	16	0
Golden Flint.....	15	0
Harkaway.....	10	0
Total number of stamps.....	929	552

It is stated that the majority of these are custom-mills, run under the management of lessees of mining properties, and it is given in excuse for the number of idle stamps (377) that at this season of the year few of the mines are working their full force.

The following brief description of some of the mines of Gilpin, taken from the Denver Tribune, may be found interesting:

It is the smallest county in the State of Colorado. Steep as the slopes are, one may travel from one end to another on foot in an hour and across it in less time. It is a little corner between Boulder and Clear Creek, that on the map looks like a pocket. Its population since 1866-'67 has at no time exceeded 8,000, and is at present about 5,000, one-third miners. Its production this year will be from two and a quarter to two and a half millions, and the greater part of this from not over twenty mines. Though twenty years in operation, only a very small fraction of the veins discovered and partially opened are worked, but each year increases the number. The Bobtail is worked to the depth of 1,000 feet, and is a labyrinth of drifts and levels. The Briggs shaft is

down over 900 feet, the Gunnell 836, the California nearly 1,200, the Ophir 1,000, the Monmouth-Kansas 1,150, the Hidden Treasure 1,000, the Kent County 700, the Gregory 600, the Williams 600, and many others ranging from prospect holes to five and six hundred feet in depth. The large belt of silver fissures discovered above Black Hawk two or three years ago is yielding about \$150,000 annually from development work.

The following extract from the Rocky Mountain Mining Review in relation to the placer mines of Gilpin County is given:

The placer mines of Gilpin County are gradually passing into the hands of the Chinese. Russel, Leavenworth, Illinois, and Lake Gulches are almost entirely controlled by them at this time, and some of them are branching out to the old abandoned gulches to the west and northwest of Central. This class of miners have produced the bulk of placer gold for the year. Along North Clear Creek, below the city of Black Hawk, several companies have worked outside of Chinamen.

CLEAR CREEK COUNTY.

This, next to Lake and Gilpin, is the largest producing county of the precious metals in the State. Its production for the fiscal year 1880 was almost equal to that of Gilpin, with the difference that it was almost entirely silver, while Gilpin's was principally gold. I have estimated the production of this county for the fiscal year named to be, gold, \$158,000; silver, \$2,230,000; total, \$2,388,000; between \$400,000 and \$500,000 more than in 1879.

The following estimate of the production of the county for the calendar year 1880 is taken from the Mining Record for January, 1881:

CLEAR CREEK COUNTY PRODUCT.

The product of this important Colorado mining county for 1880 is reported, as we suspected would happen, at materially higher figures by the local press than was given in the statement which we copied last week from the Denver News, to wit, \$2,100,000. In an apparently careful estimate, the Georgetown Courier, assisted in its preparation by the Miner, gives the product as follows:

Georgetown Mills	\$1,979,686
Less 873 tons, worth	51,338
	<hr/>
	1,928,348
Shipped from mines to smelting works	1,035,000
Empire	22,500
Dumont (gold)	3,880
Idaho Springs (gulch gold)	5,000
	<hr/>
Total	2,994,728

The Courier accompanies its estimates with the following explanations:

"The ore was reduced to bullion at ten different smelting works, *i. e.*, the Boston and Colorado Works, at Argo; the Moore, Golden, Golden and French Works, at Golden; the Farwell and Clear Creek Mills, in Georgetown; the Geneva Works; and the Omaha, Wyandotte and Saint Louis Works.

"The ore is rated at its assay value (the same as if it all had been smelted in the county), and as many of the returns did not have the value of the different metals separated, we are compelled to give the aggregate, with the exceptions of the gulch gold from Idaho Springs and the mill gold from Dumont. It is probable that about 84 per cent. of the total was silver, 10 per cent. gold, $3\frac{1}{2}$ per cent. copper, and $2\frac{1}{2}$ per cent. lead. From the amounts returned by the mills in Georgetown we have deducted 873 tons, valued at \$51,388, which was sold by one mill to another, and consequently appears in the returns of both.

"The ore shipped direct from the mines to the smelters out of the count, includes the product of the Freeland, Hukill, Tropic, and about twenty other mines at the eastern end of the county; the Murray, at Lawson; a portion of the product of the Stevens and Geneva district."

The following, from the Idaho Springs Advance, is taken from the Mining Record:

FREELAND.—At the Freeland Concentration Mill, located on Clear Creek, at the mouth of Trail Run, Mr. Davis is putting in sampling works and otherwise arranging all matters for an active season's work.

(From a previous issue of the Advance we learn that the product of this property for 1880 was \$393,000.)

HUKILL.—Last week a fine body of mineral, the major being concentration ore, was struck on the Hukill, the ore body lying the full width of the vein, 5 feet. From 30 to 40 tons are being sent daily to the Stephens Mill for treatment. The daily shipments to the mill would be largely increased could the railroad haul more. In consequence of the fine showing, Colonel Osbiston was buying Hukill stock last week. We did not ascertain the number of shares purchased nor the price paid.

(From a previous issue of the Advance we learn that the product for 1880 was \$133,000.)

The following description of the mines in Clear Creek County is taken from a late issue of the Denver Tribune:

No one needs to be told anything more of the mines of this noted section than that this has been a year of extraordinary progress among them. Last year the gross product was about \$2,200,000. This year careful estimates give an increase of \$300,000 or two and a half millions. This aggregate is gathered from multifarious sources, but chiefly from the great fissures about Georgetown, seconded by Red Elephant district, six miles below, on Clear Creek. Idaho Springs has recently come into line with a number of large silver veins, which yield ores of good average grade. This section has made marvelous strides since 1879, and its immediate neighbor, located near the headwaters of Chicago Creek, is endeavoring to become a formidable rival. Some strong and rich fissures are being opened there, the major part being gold. At Spanish Bar the Hukill, Mayflower, and one or two others are doing well. There is a lull at Freeland, but it will be very active next season. The ores of that region, so far as exposed, are in large fissures, but low grade, requiring cheap concentration and treatment by smelting.

The most extensive and valuable belt of silver fissures yet discovered in Colorado is at Georgetown. Among them are the Terrible, Colorado United (owned by an English company) and under the superintendency of General W. A. Hamill; the Dunderberg (East Terrible), owned in New York; the Seven-thirty, East Roe, and Hercules, Captain Wells, on Brown Mountain; the Coldstream (formerly Maine and Phenix), managed by John Glenn, of Baltimore; the Dives and Pelican group, the Zillah, Unicorn, and others; the Dunkirk, Baxter, Consolidated Pay Rock, Snowdrift, Peters, and Silver Plume, on Republican Mountain; the Astor group, six lodes; the Fred Rogers, Emma, Lucky Hesperus, and several more on Democrat Mountain, all or nearly all of which are producing greater or less quantities of rich ore at this time. On the south side of Clear Creek is Saxon Mountain, which contains a number of good lodes, as the Saxon, Magnet, and Comet. On Leavenworth Mountain are the Herkimer, Gilpin, the Equator, and Colorado Central groups and those cut by the Marshall tunnel. West of this tunnel is a group of seven lodes, the Big Blue, Ni-Wot, Midas, and others operated by George L. Sykes. Along East Argentine, near Gray's Peak, is another considerable group, and in Horseshoe district, near the foot of the same peak, a collection of very rich fissures have been discovered and opened during the year. All these belts are being improved, and every season brings an increase of the silver crop from new sources. The deepest shaft in Clear Creek County is on the Terrible, which has attained the depth of 1,000 feet. The remainder range from 100 to 500 feet in depth. The Terrible shows a stronger crevice, or ore vein, at 1,000 feet, with a rather better average value than at any point above. At Georgetown, the terminus of the Colorado Central Railway in that direction, are a number of ore-sampling works, which buy for outside smelters, as Argo, Golden and Omaha, besides two which purchase and treat the ores on the ground—the Clear Creek County mill by stamping, roasting, and leaching, and the Farwell Reduction Works, which stamp and roast, but, instead of the leaching process, use amalgamation. The roasting in both cases is performed by Bruckner cylinders.

One of the most noteworthy enterprises started in Clear Creek during 1880 is a project to drive a tunnel from the base of Kelso Mountain on Quail Creek to a point near Decatur on the western slope, a distance of four miles. Men are at work on both ends of the tunnel, which is called the Atlantic and Pacific. Having begun only a month or six weeks ago, not much progress has been made. If they are strong enough financially to complete this enterprise, they will open a very large number of fine lodes at great depths, and measurably solve the yet unsolved problem of the downward extent of these silver fissures.

The Red Elephant Mining Company, of New York, are operating the group of that name at Lawson's, and no very large output of bullion has resulted since last mid-summer. The underground development has been very extensive.

BOULDER COUNTY.

This county contains the very remarkable telluride ores besides many silver mines, including the famous Caribou. I have estimated the production of this county for the fiscal year 1880 to have been about \$800,000, of which about three-eighths was gold and five-eighths silver. The figures stated are, if anything, in excess of the actual product. The following statement of its production, taken from *The Daily Register-Call*, December 31, 1880, gives the production for the calendar year 1880 (taking silver at its value in coin) at about the same:

We had hoped to give the statistics of the mineral product of this county, but have been disappointed in getting them. The output, however, of this county may be put down at \$800,000, if not more. This would be a decided increase over last year's production, and shows that Boulder has not been behind in the development of her grand mineral resources.

The following description of the mines is taken from the *Denver Tribune*:

A few years ago, through the discovery and operation of a number of very rich telluride mines, in connection with the splendid fissures carrying silver in development at Caribou, Boulder became a center of great interest. The telluride veins were the largest and richest ever known in the history of mining. Many of the ores were of fabulous value, and for a time fortunes accumulated rapidly. Mineralogists throughout the world were eager to obtain specimens of it for private and public cabinets, and tons were packed and shipped to all quarters of the United States and Europe. The Prussian, Slide, and Cold Spring, at Gold Hill; the American, Emancipation, and Grand View, at Sunshine; the Melvina, at Salina; the Keystone and Mountain Lion, at Magnolia; the Smuggler, at Balarat; the John Jay and Last Chance, at Providence, all contained more or less of this marvelously rich mineral, but only a few of them are in the markets to-day. In many the ore bodies have been exhausted, and the explorations for new ores were not largely successful. Boulder is still producing considerable bullion from various sources, but principally from the Prussian and Emancipation, in the Telluride district and the Caribou silver district. The greater portion of the ore was shipped to Argo and other large markets for treatment.

CUSTER COUNTY.

The production of this county seems to be steadily increasing. I have estimated it to be, for the fiscal year 1880, about \$880,000, of which all but about \$100,000 was silver.

The following estimate of the production for the calendar year is from the *Silver Cliff Gazette*:

The following statement includes only the ore extracted and sold, or converted into bullion here, and approximates the actual product of Custer County for the year 1880:

Silver Cliff Company, working ten months	\$275,000
Bull-Domingo, working six months	250,000
Hecla, working one month	5,000
Song Bird, working one month	6,000
Julian (Sarane), working one month	4,000
Buffalo Hunter, working one week	2,600
Plata Verde, working one week	2,500
Lone Star, working one month	2,000
Vanderbilt, working one month	2,000
Kate, working one month	1,600
Bassick (estimated), working five months	200,000
Leavenworth-Chieftain, working one year	75,000
Humboldt (estimated), working one year	35,000
Polonia, working four months	25,000
Invincible (estimated), working three months	5,000

Lucille, working four months.....	\$5,000
Ben Franklin, working one month.....	2,500
Del Monte, working four months.....	2,000
Twenty-Six, working two months.....	2,000
Silver Coin, working two months.....	1,000
Horton, working three months.....	1,600

904,800

A low estimate of the ore extracted but not sold, and which will be milled here, is 10,000 tons, valued at \$20 per ton, or	200,000
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Total 1 104,800

The following brief description of its principal mines is taken from a Leadville paper:

Turning now to the south, the mines of Custer County demand a passing notice. It was in 1877 that the famous Bassick mine began to show evidence of value. Previous to that find, the Pocalontas, the Humboldt, the Leavenworth, and the Virginia were the only mines in Custer County which had yielded pay mineral, and they, in 1877-78, ran into a lean streak. But the Bassick mine is supposed to have yielded half a million in the first year of its existence. Unlike any other ore in the world, it is found as the coating of boulders, carries both gold and silver.

Seven miles west of Rosita and the Bassick mine stands the town of Silver Cliff, with the well-known Racine Roy and Silver Cliff mines, and beyond them the Plata Verde, Horn Silver, and Bull-Domingo, which are all producing mines, with good prospects.

PARK COUNTY.

The estimated production of this county for the fiscal year 1880 is about \$455,000, all, except some \$55,000 gold, being silver.

The following descriptions of the mines of the county are taken from the Leadville Chronicle and the Rocky Mountain Review:

Park County embraces the old mineral lodes on Mount Bross and Mount Lincoln and the more recently discovered lodes in the Mosquito range, besides an extensive placer ground in the Valley of the Platte. Up to the end of 1878 it was figured that Park County had yielded \$6,000,000 in mineral, about equally divided between gold and silver. This was for a period of about eight years. Over one-sixth of this product came from the Moose mine, and was altogether silver, while the Dolly Varden is said to have yielded something like \$300,000. On Mount Lincoln and Buckskin Gulch several lodes have been producers during the decade, and are more or less worked. On the Mosquito the London has been well known for several years, but has not figured to any extent in the host of producers. The mineral value of the range has been long a matter of debate.

Mount Bross, up to the discovery of Leadville, was one of the largest silver-producing mountains in the State. Its yield has been about five million dollars' worth of silver.

The mines which have produced the most in value are the Moose and Dolly Varden. A large number of good mines are fast coming to the front. The Moose mine belongs to the Moose Mining Company, which owns a large number of mines in a group covering 160 acres of mineral ground, of which but about 3½ acres have been worked, yielding about \$3,000,000. The Dolly Varden joins the Moose toward Alma, and covers about 30 acres of rich silver-bearing contacts. The silver ore on this mountain is nearly always found in contact with porphyry and lime, often pitching at an angle the same as the mountain. A lower tunnel has been driven about 1,000 feet distant from the present workings, and when the line of contact was cut it opened a large and rich body of ore, proving the mineral continuous in that direction. The Randolph group is new property alongside of the Dolly Varden and Moose. The same contacts of the former passing through this property, they can be easily traced. These mines are to be actively worked the coming summer, and will very likely add a considerable amount to the silver product of this mountain. This property comprises in its boundaries about 41 acres, with the Dolly Varden and the Moose on one side and the Como joining on the other. The latter is on the same vein of contact as the Dolly Varden. The ore sold from here has averaged about 400 ounces silver per ton.

The Gregory group covers six mines and has large bodies of ore opened by short shafts and drifts, which only show that the ore is there in large quantities and of high enough grade to pay largely.

GUNNISON COUNTY.

This is the latest of the mining regions of Colorado which has been discovered, and bids fair to be a very productive one, but owing principally to its being a new and far-away region it is doubtful whether much valuable ore has as yet been shipped from it. Its production has been variously estimated. I have given it for the fiscal year 1880 at about \$300,000, all silver. It is doubtful whether the actual production is as high as the figures stated. The following interesting account of the development of the Gunnison country, and a review of its mines and their workings, is taken from the Rocky Mountain Mining Review:

The Gunnison country, which has created such an extended furore during the past few years, and which is destined to loom up grandly as one of the richest mineral sections of the great West, was but little known to the civilized world prior to 1861, when discoveries of the precious metals were made in Washington Gulch, Union and Taylor Parks.

Until 1872 little was done, whilst in that year important discoveries of silver-bearing rock were made in the Elk Mountains. During the next five years there was a small accession of settlers. Eighteen hundred and seventy-eight proved to be the hardest year of all for the settlers. Leadville drew off large numbers, but still others came. But there was no business of any kind of importance. A smelter was being put up at Crested Butte, a place started, yet little was done there. In the fall of that year mines were opened in the eastern part of the county, in the carbonate field, which led to the speedy settlement and development of the whole country. The news of the rich carbonate strikes spread far and wide, and in 1879 opened with a good prospect for all interested in the welfare of the Gunnison country. Hillerton, Virginia City, Pitkin, Gothic, and Irwin were all laid out and built up to some extent that year, and the town of Gunnison kept pace with all and improved rapidly. Roads were built and machinery put into the different camps, and the name of Gunnison attracted the people of all sections of the Union. The year 1880 opened with great promise to the people of Gunnison. All the country—valleys and mountains—filled up rapidly. Gunnison, the county seat, thrived beyond all expectations.

COCHETOPA DISTRICT.

A prettier location for a mining camp could not have easily been found than this. The principal mines are situated on the hills adjoining the banks of Cochetopa Creek, on either side, and are embraced in an area of not to exceed five or six miles up and down the stream, the clear, cool waters of which furnish an abundance of fine trout in their season. The low, smooth hills are peculiar to the locality, and with few exceptions are unmarred by the unsightly ruggedness of higher altitudes. The quartz formation is nearly all of the California white rock type, which, as a general thing, has not been considered of very great value in Colorado until the Cochetopa discoveries. The best ore is of a white color, intermingled with streaks of green copper stain and seams of iron schist. It carries gold principally, but in some instances the assayers have returned from a trace to five and six ounces of silver to the ton. Quite a quantity of pure galena has also been unearthed.

Foremost among the mines is the Lubricator, the first and most important location in the district, having been staked off on the 5th of August last. From a two and a half foot development the quartz began to show free gold. The vein is a true fissure, about 14 inches in width, with green tale between the walls and vein proper. The shaft is down only 18 feet and the lead is widening out.

The mine next in importance is the Golden Leaf, and is situated across the gulch from the Lubricator, and shows up about the same class of ore and wall rock.

Other mines in this locality giving great promise may be mentioned as the Mollie Mack, Maple Leaf, Little Nellie, Colonel Elliott, the Irwin, and the King Solomon. Good properties, yet of lesser importance, may be noted as the Bon Homme and Vide Poche. About the middle of October last the Goldstein was discovered and located at a point about five miles above Camp Willard. The main shaft is down 35 feet, and the vein shows a face of $4\frac{1}{2}$ feet in width, consisting of white quartz with gray copper and white iron. It also shows a considerable quantity of free gold. About a mile distant, in a southwesterly direction, lies Mineral Hill, on which is situate a group of mines, prominent among which are the Gray Eagle, Bald Eagle, American Eagle, Mineral Hill Lode, Lightning, Clyde, Big Cross, and Little Cross. Numerous other properties are in this district, the most of which will come into considerable notoriety ere many months shall have passed.

RUBY CAMP.

Irwin, the great central point of the now world-renowned Ruby mining district, is situated in the Elk Mountains, 30 miles west from Gunnison City, bearing a little to the north. It derives its name from the quantity of ruby silver ore predominating here. The mineral extends 6 miles to the north and 3 miles to the east and west of us. The anthracite coal beds on the south and west, and the galena district beginning with Elk Basin on the east and north, form distinct boundary lines to this celebrated silver field. The pay matter, in most instances, has started at the surface in the shape of greenish chlorides of silver, and at a depth of 3 to 6 feet ruby, brittle and native silver have manifested themselves, as notably in the Forest Queen, Ruby King, and Ruby Chief lodes, and at a greater depth sulphurets of silver have appeared. To a depth of 40 or 50 feet, the ore, although of unexampled richness, has not often proved so refractory as to necessitate any very complicated process of treatment. Arsenical iron and zinc, those uncomfortable apparitions to the miner, although they argue well for the strength and permanency of the veins, are beginning to show strongly in some of the deeper shafts.

The first silver discovered in this camp was in June, 1879. The first claim was named the Rough and Ready, and soon after the Ruby Chief, Old Sheik, and Arab were located. Systematic work was at once commenced upon these claims, and it continues steadily, yielding rich returns in ruby silver ores.

Old Mexico and Durango are two mines belonging to a New York company. They are very rich lodes, and their development is being extensively pushed. The Durango is undergoing the work of tunneling, and ore is being sacked for shipment. The Lead Chief is employing about twenty-five men. It has a complete set of hoisting works and splendidly rigged pump run by steam. Bullion King and Monte Christo were among the first mines discovered in this camp. They lie west of town, near the foot of Ruby Peak. Shafts have been sunk, and drifting and tunneling are being extensively carried forward. The Last Chance is an exceedingly rich property. Among some of the other numerous mines of the camp are the Crystal, Diquita, Beeswax Phoenix, Elk, Jenny Lind, American Girl, Clara Fisher, Snowflake, Burlington, and, others. Ten miles southwest of the camp, and extending an unlimited distance, is found an inexhaustible deposit of anthracite coal. Two mines are now open. The bituminous deposit lies to the east of the camp a few miles, and extends a little south of east. From this deposit coke of a very superior quality is made at Crested Butte. It is not treated in ovens, as at El Moro, but coked in the open air, after the manner in which charcoal is burned. A mill of ten stamps and a sampling works are kept constantly going at Irwin, and their capacity falls far below the demand made for the treatment of ores.

OHIO CITY.

In May last a camp was started about 7 miles south of Pitkin, to which has been given the name of Ohio City. Its elevation is 8,100 feet above the sea-level, and in its immediate vicinity some claims have been opened giving forth indications of great richness. The Saint Lawrence Mining and Milling Company have a group of four mines. The mines are the Brooklyn Girl, Saint Lawrence, Blue Ridge, and Massen Girl. Tunnels are being driven to cut the vein. One of these is in about 80 feet, and the other half that distance. The Blue Bird group consists of six claims—the Blue Bird, Ontario, Flag Staff, Washington, Cphir, and Racine Boy. These are to be cross-cut by a 100-foot tunnel. Thus far, only the assessment work on these two lodes has been done. The Iron Chief, at a depth of 20 feet, makes a showing of forty ounces in silver.

ASPEN CITY.

This point of the Gunnison, we learn from Mr. James Harrington, is making splendid headway despite the prevalence of winter. The city itself is improving at the rate of about five houses per day. All the lumber gotten out by its two saw-mills is immediately consumed in the construction of edifices. Extensive preparations are being made by both business men and miners for magnificent operations in the coming spring. The prospects and mines of this vicinity are all looking well and give forth much encouragement. The Smuggler, owned by George G. Roberts & Co., has a shaft down 45 feet. A tunnel of 150 feet is in upon the Trayner, owned by Harrington & Co. It has cut 17 feet of mineral. The Spar, owned by Breed & Co., of New York, has a shaft of 75 feet. The Durant, bearing mineral of a similar character, is another prospect owned by Roberts & Co. The Chloride shows up well under development. The Minard makes a similar showing to the Trayner. About 250 miners are now working in the camp. Several of the mines are sending ore to Leadville for reduction, employing jack-trains for its transportation across the mountains.

The Antelope Gold and Silver Mining Company.—Its property is at Aspen City, Roaring Forks district, and consists of ten claims, lying in two groups. The Wild Horse,

Belle, Texas Ranger, Point, and Tenderfoot are northwest of the well-known Smuggler, and join the claim called the Smuggler No. 2. The ledge or vein of mineral is known to extend several miles, and is traced from Aspen Mountain, where are found the Monarch, Spar, Galena, Pioneer and others across the Roaring Forks River to the Smuggler, and it extends along up Hunter's Creek. The other group of five claims, the Time, Francis, Fisher, Atlantic, and Grand Army, lie near the base of Red Mountain, about a mile and a half from Aspen City. Here is found a very wide ledge of lime-rock, near the center of which is a vein fully 15 feet in width, which carries iron spar and carbonate of lead. The Grand Republic is down 20 feet. The work is being carried steadily forward and will be continued throughout the entire winter. The ore is to be piled upon the dump, there to remain until the smelter starts up next summer.

ELK MOUNTAIN.

The Elk Mountain Mining Company owns the Nevada mine and half of the Last Chance. The Nevada is located about $6\frac{1}{2}$ miles from Gothic, between the Eureka and Cliff mines, and is thought to be the mother vein of both. The location is above timber line, and is easily reached by good roads from Gothic and other accessible points. Good water-power is close at hand of sufficient power to run the largest class of concentrating works. This ore can be mined and milled for less than \$6 per ton.

An account of the reported discovery of a field of carbonates, similar to those of Leadville, in the Gunnison country, taken from the Denver Tribune, is annexed:

PETERSBURG.—There will be a new mining town and a new mining district the coming season which gives promise of considerable importance. The district, however, has already been established and the town assuming the proportions of a grown camp.

From the reports of Leadville papers and the papers of Gunnison County, it appears that a wonderful field of carbonates similar to the deposits at Leadville have recently been discovered in what is now known as Spring Creek, on the Red Mountain trail, situated 55 miles southeast of Leadville, 45 miles west of Buena Vista, 35 miles northeast of Gunnison City, and 30 miles east of Ruby Camp.

The discovery at this camp is not entirely new, but it was not brought into prominent notice until late last summer, when a number of important developments attracted considerable attention in mining communities. The carbonates are reported as exactly the same as those that have yielded to Leadville its vast wealth, while the galena veins grow richer with their development.

A large number of claims have been opened with a development of from 10 to 30 feet only.

Late in the summer of last year some very important discoveries were made in the Spring Creek district.

The following article on the Crystalline mine is furnished by George H. Parsons of the Colorado Springs Company:

I have only to report at this late period upon a partly developed but still representative mine in the Gunnison country. A great excitement prevailed during the past year about the Gunnison country, and large numbers of people rushed there from all parts. The reports of it were wonderful, far exceeding anything that had yet been heard of. But like all fevers it gradually died out, and many returning dispelled the illusion. Still the Gunnison is a very rich mining country, and rich ore in large quantities is found there, but it is in a very rough country, covered with snow and impassable for six months of the year. Work must stop during a large part of the year, and all necessities of life will be difficult to get. The Denver and Rio Grande Railway is pushing out there with great energy, and will soon reach it and greatly help the development of the country.

The mine I have to speak of now is the Crystal Mine, 90 miles from Ruby Camp, and was opened June 24, 1879. The surrounding country is very mountainous and rocky, with mines at the altitude of 11,000 feet. Throughout that region are found fissure veins of silver-bearing rock and veins of anthracite coal of good quality. The ore in this mine consists of ruby, wire, and native silver in connection with zinc, iron pyrites, and white iron. It assays from 123 to 2,023 ounces of silver to the ton, with a heavy trace of gold, and is found with a gangue of white quartz in a vein 9 feet wide, with a pay streak from 5 to 18 inches wide. The surrounding rock is composed of slate and lime.

There are three shafts sunk, one 65 feet, one 8 feet, and one 10 feet, also one tunnel 52 feet long. The shafts follow the course of the vein and incline from the perpendicular.

The Gunnison Crystal Mining Company have seven claims but have only developed the Crystal. The streak grows richer and wider with depth, and will no doubt prove very valuable.

SUMMIT COUNTY.

The production of this county has increased largely over 1879. I have estimated it for the fiscal year 1880 to have been, gold, \$63,000; silver, \$330,000; total, \$393,000. The annexed statement of its production for the calendar year 1880 is taken from the January number of the Mining Record:

We glean from the valuable new year number of the Breckenridge Leader that during 1880 the official county records show 6,190 locations of lode and placer claims, mill and tunnel sites. This number of locations will cover at a low estimate 30,950 acres, or in all about 50 square miles of land. These have organized and incorporated 104 companies to conduct mining and milling operations. During 1879, Summit County produced \$150,000 worth of silver and lead, which, added to an estimated \$75,000 worth of placer gold also produced, made the total of \$225,000. The year of 1880, however, saw a decided change in the mining condition of the county, and which condition has materially effected a change for the better, so far as the production of precious metals is concerned. The opening of the spring months of last year saw the new Breckenridge excitement, the rapid growth of Ten Mile, and it witnessed during its closing days the mines of the Eagle River fairly launched upon the wave of prosperity. All this, besides the steady production of ore from the older mines of the Snake River, and the inauguration of a decided stir among newly discovered fissure veins of that section. When these facts are taken into consideration, and when the totals received from different localities are summed up, the value of Summit County's precious metal yield may safely be set down for 1880 at \$450,000, divided among the different districts as follows:

Ten Mile.....	\$200,000
Snake River.....	100,000
Blue River (including \$50,000 of placer gold).....	100,000
Eagle River.....	50,000
Total.....	450,000

In none of the regions specified in the foregoing has there been the given amount of money paid for ore, but the figures stated will stand a thorough test when it is taken into consideration that hundreds of tons of ore have been mined, but which have never left the dumps of the property from which it was taken. This is due to the circumstance that in no one of the regions mentioned has there been adequate smelting facilities for treating the ore, and in many other instances the location of the mines is such as to render shipment impossible until better and cheaper modes of transportation can be furnished.

The following description of its mines is from the Denver Tribune:

Summit County covers almost as much territory as Gunnison, and while it has been brought into extraordinary prominence during the past two years, the discovery of valuable placers there in 1860, contemporaneously with those in Gilpin, Clear Creek, Park, and Lake Counties, it attained little or no celebrity as a quartz-mining center until after the great strike of carbonates at Leadville. It has now the famous Ten Mile district, embracing three prosperous towns, Breckenridge, Chihuahua, Montezuma, and Eagle River, or the Red Cliff and Battle Mountain districts, all of which have grown into substantial and exceedingly active camps. Of these, Kokomo and its immediate neighborhood are the most productive. Here a number of splendid groups are located, among them the Robinson, which is one of the finest in Colorado thus far demonstrated. In the short time since the occupation of this district, notwithstanding the brevity of the mining season, a world of treasure has been exposed. The climate of Summit County is usually very severe, the winters long, the snow-falls heavy, but the field is broad and rich with every variety of minerals, carrying gold, silver, and copper. For this reason, no matter what the obstacles, it will be fully developed.

Breckenridge has a number of excellent mines. Though three smelters have been erected there the past year, not one of them is in blast at this time. The Union, Minnie, Shock, Brooks & Snider, Warrior's Mark, and Laurium are idle. The owners of the Warrior's Mark are shipping their ores to Denver for treatment; others are send-

ing theirs to Lincoln. Breckenridge should have contributed a million dollars to the general harvest this year, and its mines put in condition for double that amount in 1881, but it has shipped less than a quarter of that sum. Montezuma and Chihuahua, on Snake River, are the centers of large belts of silver fissures carrying valuable ores, but owing to their altitude, the length and severity of the winters, but chiefly for the want of reduction works and well directed efforts, have never created excitement.

Red Cliff, on Eagle River, is the seat of large blanket deposits of the carbonate order. Several promising contacts, notably the Belden group, have been opened the past summer. They are rich in lead, but rather low grade in silver, still capable of producing largely.

CHAFFEE COUNTY.

This county was formed from a portion of Lake County less than two years ago, and as yet has produced but little valuable ore. The production for the fiscal year 1880 was probably in the neighborhood of \$90,000, about one-third gold, which is probably larger than the previous year.

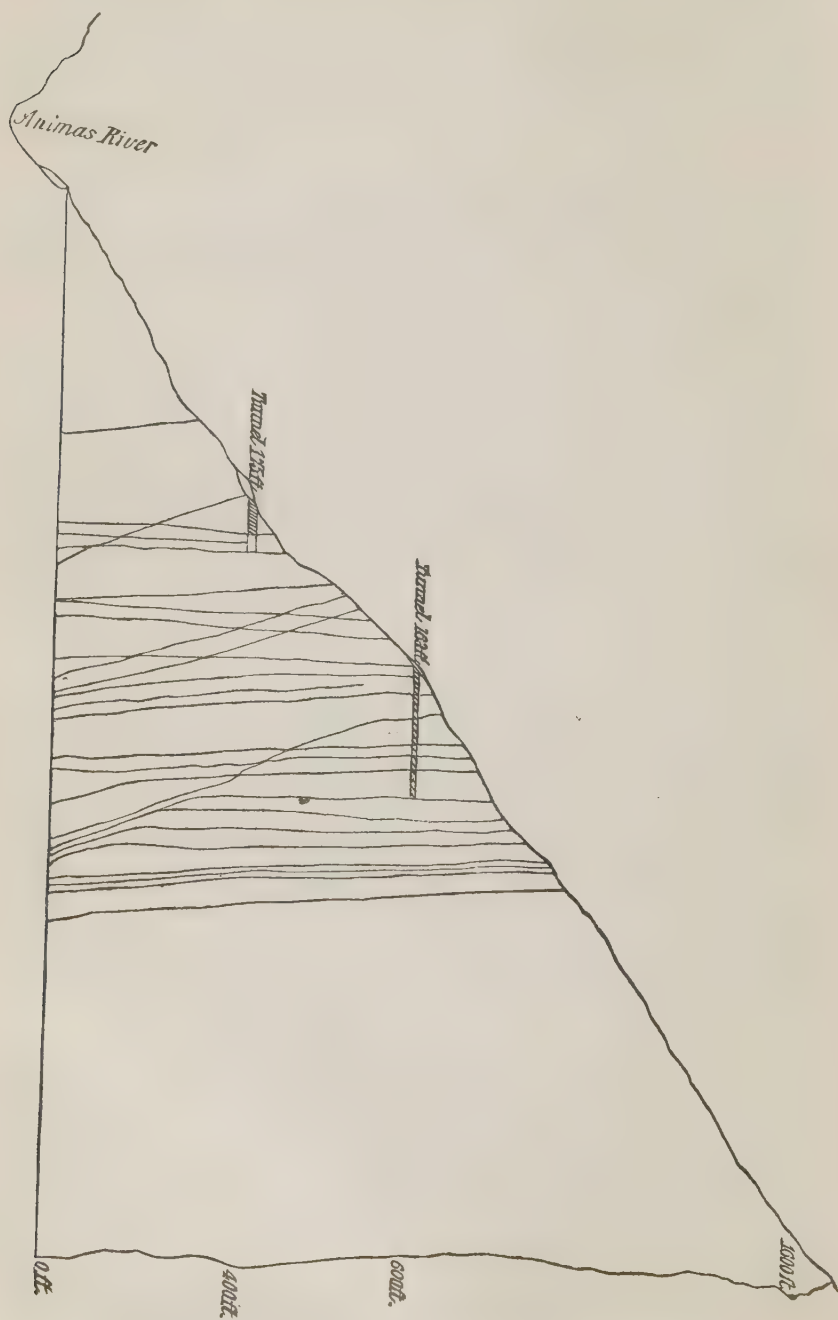
The following description of the mines of the county is taken from the Denver Tribune:

About two miles northeast of Buena Vista is a group of mines carrying free-gold quartz, the most important being the lode known as the free gold, which has been opened at different points for about 6,000 feet. It has considerable development. On a small stream called Four Mile (that distance above Buena Vista), a tributary of the Arkansas, a number of lodes have been discovered, but none of them are developed much beyond the requisite assessment work. The ores carry silver and gold, the former predominating. In Cottonwood district there are heavy deposits of galena and carbonates in the limestone formation. Development light; but some valuable ore has been uncovered. On Chalk Creek a good deal of work has been done the past year, and many discoveries made. The ores are chiefly galena and sulphides, carrying silver, and are of the free smelting variety. The Brittenstein group has been worked for development only, and not for profit or stock jobbing. The ores are rich and extensive. The Tilden mine, operated on the same plan as the Brittenstein, carries high-grade ore. At the head of Chalk Creek, about Forest City and Hancock, the prospecting has been very extensive, and many lodes uncovered, some of which are promising. On the North Fork of the South Arkansas some of the largest bodies of galena ever found in the State have been opened the past summer, but they are mostly low grade in silver. About Garfield, on the South Arkansas, the Gunshot, Brighton, and Columbus are large producers. The latter is one of the finest mines in the State and capable of producing 50 tons per day under present development. On Monarch Mountain, about Chaffee City, the Black Tiger, Fairplay, and Lexington lodes have each produced some ore, but are being worked for development only. The Monarch, one of the best mines in the district, is, from some unaccountable reason, idle, though the workings have uncovered vast bodies of valuable mineral. The fine gulch or placer mines along the Arkansas River have yielded the usual amount—about \$25,000 for the season. There are five small and apparently inefficient smelters in Chaffee County—one at Garfield, two at Maysville, one at Poncha Springs, and one at Forest City, on Chalk Creek. Neither have done much, most of the higher grades of ore being shipped to Pueblo and Argo. Many other mines beside those above mentioned are under development. An important strike is reported in the Desdemona, in Monarch district, and the United States Treasury is said to be shipping valuable ore to market.

SAN JUAN COUNTRY.

The mining region known under the above title is located in Southern Colorado, and embraces the counties of Hinsdale, San Juan, Rio Grande, La Plata, Conejos, and Ouray. On account of its great altitude and severe winters, want of railroads and consequent expense of mining and shipping, but little has as yet been done towards developing this country, and only high-grade ores can be worked at a profit. I have estimated the production for the fiscal year 1880 at \$400,000, \$50,000 of which was gold.

The following interesting paper, descriptive of the Silver Wing mines and notes of the country, is furnished by George H. Parsons, esq., of Colorado Springs:



Section of the Silver Wing Mines, San Juan, through tunnel line.

San Juan County, in the northern part of Colorado, and on the western slope of the Continental Divide, has not been much developed as yet, but what work has been done there has shown it to be one of the richest in precious metals of the many localities that have been discovered of late years. Mineral is found in very great quantities, though possibly not as rich as has been found at Leadville or in the Gunnison. Herefore the difficulty of communication with this county has rendered the development of it slow and imperfect. But the Denver and Rio Grande Railway has now reached certain points in it and has made its wealth available.

In the San Juan County there are no less than three distinct local belts of mineral. In the southern portion, from the mouth of Cunningham Creek south, the mineral is in much narrower veins than further north, and then is principally heavy galena, with occasional bodies of mineral interspersed with rich argentiferous gray copper. Although the veins are generally small in this portion, yet there seems to be at least one large vein to each mountain, cutting nearly through its center, and these large veins are mostly galena at the surface.

North of the mouth of Cunningham Creek, and south of Eureka, lies the second local mineral belt, in which the mineral is nearly all galena. Between Eureka and the head of the Animas River lies the third class of ore in this region, the principal lodes carrying larger quantities of ore, fine galena and gray copper in masses, but of lower grade in silver than that found in the southern portion of the county. In this region the mountains are rugged, rising above timber line, and frequently to a height of over 14,000 feet above tide-water, and generally 4,000 or 5,000 feet above the stream on which they are situated, thus giving a fine opportunity to work the mines economically, tunneling directly, instead of shafting, to reach the ore at a depth. The nature of the gangue is invariably quartz, containing almost always iron pyrites.

The largest population of San Juan County will be found in the Animas valley, and perhaps the most beautiful, fertile, and pleasant park in the world is the Animas Park, lying north and south between the forest-clad mountains, containing over 10,000 acres of tillable lands, ample water for irrigation, and a broad river flowing along one side, while the mountains around are literally vast collections of lodes of silver.

The Silver Wing mines, of which I will give a short description, are located in Eureka mining district, on the Animas River, in the third mineral belt described above. They cover one side of Jones' Mountain, which, like the whole range along the Animas River, consists of a greenish hard rock, being a compact and tough mixture of Labrador and orthoclase feldspar, with augite and chlorite, containing besides very finely-divided lime, and, principally, when veins occur, much magnetic and common iron pyrites. It is an immense conglomeration or ganglion of veins of silver ore.

The property of the Silver Wing Mining Company is an aggregation and contiguity of thirty to forty large true fissure veins of silver-bearing ore, all of which can be cut by one tunnel located at the base of the mountain and 1,100 feet long. It is estimated that about 5 miles of ore veins are contained in a space 1,500 by 1,100 feet. The accompanying sketch will show the position and course of some of these veins.

The position of these veins is such, most of them being a great height from the tunnel, that they can be worked on a large scale for many years through tunnels above without sinking shafts, and thereby the cost of mining reduced to minimum. Also the nature of the rock is such that no extensive timbering is needed, and there is little or no chance of the mines being troubled by water.

The width of the lode varies from 2 to 20 feet, and has a pay-streak or mineral width of from a few inches to three feet, increasing with depth from surface.

In every instance where excavations are made in the lodes there is found 1 to 10 feet below the surface a beautiful quartz, glittering with fine galena and flecked with argentiferous gray copper. The ores are both the arsenical and argentiferous gray copper, occurring in small crystals, granulated and compact, galena, sulphurets of copper, copper pyrites, and sulphurets of zinc. The gangue is invariably formed of quartz, containing almost always iron pyrites. The ore is not extremely high grade, but its abundance and accessibility render it more profitable than many high grade ores. Assays of it average about \$300 gold and \$500 silver per ton. Some of it has assayed as high as \$2,100 per ton gold and silver. The ore known as bornite is found here and other ores rich in copper.

I have described these particular mines because of their peculiar character and the number of veins concentrated in a small space. It seems to be the starting-point of all the lodes of that locality, which branch out in various directions. A number of these lodes can be plainly traced by the naked eye along the side of the mountain, forming streaks of white through the bare greenish rocks.

The Denver Tribune for January, 1880, estimates the production of the State for the calendar year 1879 to have been as follows:

Product of precious metals for the year 1879 was \$19,110,862. In 1878 it was \$9,820,743.12, showing an increase in one year of \$9,290,118.88.

The product came from counties, as follows:

Lake	\$11,477,046
Gilpin	2,608,055
Clear Creek	1,912,410
Boulder	800,000
Custer	720,000
Park	434,749
Gunnison	300,000
Summit	295,717
Chaffee	71,240
San Juan Country	491,645
Total	19,110,862

This estimate doubtless includes considerable lead, but the value of the silver is probably calculated at about its market price. Using this and other published statements in the Colorado papers as a basis, the value of the gold and silver produced in the various counties in the State during the calendar year 1879 would be approximately as follows:

Counties.	Gold.	Silver.	Total.
Lake	\$90,000	\$10,600,000	\$10,690,000
Gilpin	2,260,000	300,000	2,560,000
Clear Creek	120,000	2,000,000	2,120,000
Boulder	400,000	450,000	850,000
Custer	100,000	700,000	800,000
Park	60,000	420,000	480,000
Gunnison		300,000	300,000
Summit	75,000	200,000	275,000
Chaffee	28,500	40,000	68,500
San Juan	60,000	375,000	435,000
Aggregate	3,193,500	15,385,000	18,578,500

NOTE.—Silver in this statement is calculated at its coining rate.

The News gives the production for the calendar year 1880 as follows:

Leadville district	\$15,000,000
Gilpin County	2,200,000
Clear Creek	2,100,000
Boulder	1,000,000
Rosita and Silver Cliff	1,000,000
Park County	500,000
San Juan region	500,000
Summit County	250,000
Total	22,550,000

An expert's guess, published in the Denver Tribune, January, 1881, places it at about \$24,000,000, and he remarks as follows:

My observations and information lead me to the following conclusions for the yield of 1880:

Boulder, Clear Creek, and the San Juan region will show a loss from the figures of 1879. With what I know I can't see how they will do otherwise. I think Park County will also lose.

Gilpin will hold herself level—1879 was \$2,625,000.

Nearly \$500,000 of the product which will appear as from Leadville's smelters should be deducted and credited to Summit County, as it came from Robinson and a few smaller mines near Kokomo. I deducted last year \$130,000 from Lake in favor of Summit.

Summit County should gain nearly \$300,000 or \$400,000; due to gains at Ten Mile. Breckinridge shipped very little. The gold yield was small.

Gunnison gains. I believe her product of shipments will not exceed \$250,000 in 1880. The Forest Queen, Silvanito, and Gold Cup are the only large shippers. I

have ascertained that the export of Gunnison for 1879 was less than \$25,000. New and far-away silver regions are slow.

Chaffee County may gain a little, but I don't believe will go much over \$100,000. Monarch district did most of it.

Custer County should gain largely, but the stoppage of production on the Bassick most of the year and light work on the Humboldt cut off much. Dillingham would not give me figures but referred me to Mathews. Dillingham should have bought and shipped from \$500,000 to \$600,000 worth of ore at his sampling mill. Custer County ought to go between \$750,000 and \$1,000,000 in 1880.

Crooke & Co., at Lake City, did most of the smelting in San Juan this year. If they did not gain heavily then San Juan is behind. The smelter at Silverton is said to have produced \$35,000. The Summit gold mines did very little, I am told, as well as those of San Miguel. The San Juan figures I gave you last winter I since found are too high. It was only \$306,000.

Boulder County must lose in about every district.

I put Colorado's gain at nearly \$5,000,000 in Lake County, and over a million in Summit, Gunnison, and Custer combined, making over \$23,000,000 or nearly \$24,000,000 for 1880 as compared with my revised figures of \$17,014,204 in 1879.

As in other published statements, these estimates probably include the value of lead contained, and are based upon the market value of the silver.

From these and other published data, the production of gold and silver in the different counties during the calendar year 1880 would appear to have been :

Counties.	Gold.	Silver.	Total.
Lake	\$58,000	\$12,900,000	\$12,958,000
Gilpin	2,380,000	300,000	2,680,000
Clear Creek	196,000	2,460,000	2,656,000
Boulder	300,000	550,000	850,000
Custer	100,000	860,000	960,000
Park	50,000	380,000	430,000
Gunnison .....	.....	300,000	300,000
Summit	51,000	460,000	511,000
Chaffee	31,500	80,000	111,500
San Juan	40,000	325,000	365,000
Aggregate	3,206,500	18,615,000	21,821,500

NOTE.—Silver in this statement is calculated at its coining rate.

In distributing the production of the State for the fiscal year 1880 among the counties, I have taken one-half of the estimated production of each, as given in the previous tables for the calendar years 1879 and 1880:

Counties.	Gold.	Silver.	Total.
Lake	\$74,000	\$11,750,000	\$11,824,000
Gilpin	2,320,000	300,000	2,620,000
Clear Creek	158,000	2,230,000	2,388,000
Boulder	350,000	500,000	850,000
Custer	100,000	780,000	880,000
Park	55,000	400,000	455,000
Gunnison .....	.....	300,000	300,000
Summit	63,000	330,000	393,000
Chaffee	30,000	60,000	90,000
San Juan	50,000	350,000	400,000
Aggregate	3,200,000	17,000,000	20,200,000

NOTE.—Silver in this statement is calculated at its coining rate.

The following statement of the bullion produced by some of the principal mines of Colorado during the calendar year 1880 is taken from the New York Mining Record :

Bullion production of the following mines of Colorado, as reported to and published by the Mining Record of New York.

Mines.	January 1 to June 30, 1880.	Fiscal year 1880.	Calendar year 1880.
Annie	\$379, 387	\$379, 387	\$354, 077
Bob Tail Consolidated Mining Company			224, 208
Bull Domingo			184, 720
Caribou			131, 781
Chrysolite			1, 714, 041
Dunkin			179, 278
Hibernia Consolidated			33, 464
Iron Silver Mining Company			729, 525
Little Chief	779, 065	779, 065	1, 163, 311
Little Pittsburgh			377, 428
Robinson Consolidated			853, 558
Total	1, 158, 452	1, 158, 452	5, 385, 391

BULLION SHIPMENTS BY EXPRESS.

Colorado during the fiscal year 1880 has exported by express from the places named, as reported to the Mint Bureau, the following gold and silver bullion :

Express companies.	Gold.	Silver.	Total.	Destination.
Pacific, from Boulder County	\$15, 362	\$199, 747 ⁵	\$215, 109	New York.
Do.	13, 955	460	14, 415	Denver.
Central City, Gilpin County	1, 320, 260		1, 320, 260	New York.
Golden, Jefferson County		36, 658	36, 658	Do.
Do.		2, 892	2, 892	Denver.
Denver	1, 077, 378	1, 460, 174	2, 537, 552	New York.
Georgetown	6, 750	382, 266	389, 016	Do.
Trinidad	7, 800		7, 800	Do.
Aggregate	2, 441, 505	2, 082, 197	4, 523, 702	

NEW MEXICO.

New Mexico has, up to within a short time, been destitute of railroad communications with the rest of the United States, and the development of its mineral wealth has been in consequence much retarded. Mr. Silver reports that he was unable to procure any information, and I have only the following general statement to make as to its production :

Very little has been done in the way of developing the section's mineralogical resources, as may be seen from the following table, which affords a close estimate of the yield since New Mexico became a portion of the territory of the United States :

1848 to 1868	\$2, 500, 000
1868	250, 000
1869	500, 000
1870	500, 000
1871	500, 000
1872	500, 000

1848 to 1873	\$500,000
1874	300,000
1875	325,000
1875 to 1880	2,200,000
Total 1848 to 1880	8,075,000

But it is still believed that the developments will prove that the Territory abounds in earthly treasures. Says the Sentinel, speaking on this point: The mines and placers and coal fields of the Territory seem, from the discoveries made and from the indications, to exist, scattered all over the country. Gold, silver, iron, quicksilver, marble, coal, building stone, and precious stones—indeed, nearly all metals and other productions of the ground which contribute to the use and pleasure and wealth of men—appear to exist in New Mexico. The valuable ores abound almost everywhere in the granite and gneiss of the Rocky Mountains, and the economic question is not to find the material, but the capital and labor with which to work. That the country over which these investigations were made is replete with those minerals which by their decomposition are found by experience to most enrich the soil, as it is with the before-mentioned minerals of commercial value.

Gold is known to exist in over fifty different localities in the Territory. It and silver must have been known and extensively mined by the Aztecs, as the presence of their old ruins is said to be an almost unfailing indication of mines. The Spaniards mined gold, silver, and copper in this region, and Jesuit priests more thoroughly prospected it than it has been since. They reported at all points great riches and the existence of all the precious metals. At the Placer Mountain, the Old and New Placer, quartz lodes have been opened since the war.

At the Moreno mines, at Ute Creek, and other tributaries of the Cimarron and Red River, large deposits of gold have been discovered and worked.

At Pinos Altos, quartz gold mining has received considerable attention. Thirty lodes were discovered, paying from \$40 to \$200 per ton. In this district a few years ago thirty lodes of gold quartz were worked, ten of silver or a combination of silver and gold, and three of copper. There have been picked up in one day in a gulch at Pinos Altos ores of gold, silver, lead, zinc, magnetic iron, and plumbago. The number of mines now worked there has largely increased.

Twenty-seven miles from the city of Santa Fé is the Real de Dolores or Old Placer, discovered in the year 1833, and from that up to 1840 it contained a population varying from 2,000 to 3,000 persons, the most of whom were engaged in washing out gold, laboring under great disadvantage on account of the scarcity of water, it being necessary to carry the dirt to the water, a distance of nearly two miles, or pack water in kegs and barrels to the dirt; there were at one time some dozen or more stores there with merchandise. The amount of gold taken out by this rude process is variously estimated from \$300,000 to \$500,000 yearly. Many rich gold-bearing quartz lodes were discovered, but owing to the want of water and proper machinery were not worked to any extent.

I have estimated the production for the calendar year 1880 to have been, gold, \$130,000; silver, \$425,000; total, \$555,000.

DAKOTA.

The mineral-producing regions of Dakota known as the Black Hills are situated between the north and south forks of the Cheyenne River south of the forty-sixth parallel, covering a country from 50 to 60 miles long, from 20 to 40 in width, and contain nearly 6,000 square miles of mineral-bearing rock and gravel beds.

Professor Jenny says of the Hills:

Surrounded on every side by level or rolling plains and separated from the main chain of the Rocky Mountains, the Black Hills have a geological system perfect and complete in itself, with the records beautifully preserved in the rocks, and each successive formation fully exposed, by uplift and erosion, to scientific investigation. Conceive a nucleus of upturned metamorphic rocks, mica-schists, slates, and quartzites of Archæan time, surrounded by encircling belts of the subsequent geological formations, extending continuously around the Hills, arranged in the order of their deposition, with a general dip from the center toward the level plains.

BLACK HILLS AS A MINING REGION.

Here nature presents many new and striking features before unencountered in mineral sections, and in no place heretofore discovered have the precious metals been found under conditions so favorable for rapid extraction.

The mines may be grouped under four classes, as:

1st. The vertical, designated as bad veins in the primitive broad strata.

2d. The blanket lodes, or denudated portions of the broad strata subsequently cemented by iron and silica.

3d. The horizontal sandstones and dolomites.

4th. The porphyry dikes.

The slates and quartzites are regarded as the primitive rocks in the Black Hills, differing from the general character of veins in the slates, inasmuch as the latter are of chlorite and talcose slate, interlaminated quartz, and oxides of iron, presenting a dark red appearance from the surface down over 300 feet, or as deep as the openings on the most developed mines.

In Custer County all the mines, as far as discovered, are in the slates associated with quartz. In some instances the quartz is not less than eighty feet in width, as illustrated by the "Grand Junction" and other veins.

Among the vast number of quartz locations in this section, the following may be regarded as producing properties when properly equipped: "Penobscott," "Hartford," "Dickover," "Old Charley," "Old Bill," "Grand Junction," and "Cross," all having mills, and prepared to commence operations in the early spring, or as soon as a plentiful supply of water can be obtained. There are many others deserving mention, and, perhaps, equally valuable, only awaiting development.

The seven mills referred to have a capacity of 110 stamps. They were pioneers of Lawrence County, and run on customs ores, but were obliged to emigrate to make room for mills of larger capacity.

This section is noted for its rich strata, which are numerous, and contribute mainly to charging all the gulches. Even all dry draws have been worked for the past four years, miners carrying the gravel on their backs and in wheelbarrows for distances from one-half to three miles to where they could obtain water.

Few mines in this county are sufficiently developed to form conclusive opinions as to their full extent and value when great depth shall have been attained, and from present indications it would be an injustice to draw conclusions other than hopeful that they may retain their value when deep workings are reached.

Pennington County.

The quartz veins found here are larger and more easily worked, on account of their accessibility, and possess all natural facilities to eventually make them profitable bullion producers. There are a number of properties in this county that will undoubtedly prove good investments when cheap labor can be obtained. These mines are now lying idle, and others, such as the "Standby," "Lodi Alt," "Minnesota," "Charter Oak," "Queen Bee," and "King Solomon," all having stamp-mills, with the exception of the latter, which is expected to have a sixty-stamp mill before the coming fall. So easily are some of these properties worked that it is asserted that \$1 per ton covers all expense of mining, trans-

porting, and milling, and $3\frac{1}{4}$ tons is the maximum per stamp of 750 pounds per twenty-four hours, as in the case of the Standby Company's mill at Rockford, which, running by water-power, reduces the expenses largely.

The mines of this district present vast, irregular bodies of decomposed ore at the surface, and their extent can only be estimated from surface indications, rendering extensive underground work necessary to secure reserves to supply mills of large capacity.

The placer claims in the south and southeast have been very rich in gold, and several hundred miners have been working them as "dry diggings" since the discovery of gold in this region. Nearly every hollow or depression of the mountain sides contains gold in paying quantities; and from some ravines not more than two to three hundred feet in length, ten to twenty thousand dollars of gold have been mined.

There is no wash-gravel of any note in these ravines (with the exception of Rockerville and Hayward districts), thereby showing conclusively that the precious metal comes from quartz veins in the immediate vicinity. In fact, little draws crossing the "King Solomon" (and the same with other mines) have all been worked for placer gold, and the pay dirt conveyed, as before stated, to where water could be obtained.

The introduction of Spring Creek to Rockerville Basin, last fall, will mark a new era in the bullion output of that section, and by the hydraulic process of washing the dry draws and hillsides many new and valuable quartz discoveries may result. The "Battle Creek Hydraulic Company," operating in this section of country, have valuable deposits of gravel; also the "Fort Meade," "Little Rapid," "Big Rapid," and "Vollins Company." All of these corporations will have an abundance of water during the coming summer, and will then be enabled to work and thoroughly test the gravel, which they are sanguine will yield rich returns.

Lawrence County.

Lawrence County has furnished the largest placer and quartz mines, the latter being the only constant producers in the Black Hills at the present time; and it may be safely asserted that for size and working facilities these ore bodies are without rivals upon the continent. The Homestake belt is profitably worked from South Gold Run to Deadwood Creek, a distance northerly and southerly 4,100, and within the area of which are situated the "Homestake," "Golden Star," "Highland," "Golden Tina," "Deadwood," and "Father De Smet" mines. The east ore body is worked for a distance of about 3,700 feet, on which is situated the "Amiens," "Giant," and "Old Abe," "Clara No. 2," "Queen of the Hills," and "Caledonia." North of the latter the ore vein tails out and almost entirely disappears, and is seen only at elevated points, such as the "Flora Belle," "Fairview," and "Fraction."

South of South Gold Run little has been discovered on the "belt"; in fact, only sufficient to establish a discovery.

There are many other properties classed as belonging to the "belt," such as a series of veins parallel to and west to Poorman Gulch, a distance of one mile; and also east of the "Old Abe" vein, a distance of about one-third of a mile. The accompanying or neighboring veins east and west of the "Homestake" and "Old Abe" are regarded as producing properties, and some of them are very promising, and would be worthy investments if there were a sufficiency of wood and water to work them upon a large scale.

The blanket lodes or cement deposits are mainly confined to the

"belt" and a small section on the head of "Upper Sand Creek," in Wyoming; they are also found parallel and to the east of the belt, covering large areas near the summit of the hills. These contributed much to the first introduction of mills into this country during the fall of 1876 and spring of 1877, but present developments show them nearly all exhausted. The pay rock was found in small pockets or depressions, and only extended upward from the underlying or country rock about 10 feet in the most favored localities.

In Galena district silver ores abound, and so far as present explorations have developed, these are the only galena-bearing ores of note in this region. The veins are mostly horizontal and the pay ore occurs in pockets and pipes often extending to considerable widths; when in sandstone they carry little or no galena, while in dolomites they are quite rich; the latter have been profitable producers to the present time, carrying galena, sulphurettes, chlorides, and bromides of silver and carbonate of lead. During the latter part of 1879 the Florence mill and smelter shipped \$10,700 worth of silver bullion, and in 1880 from the "Sitting Bull" mine there was shipped to the Omaha Smelting Works 74 tons of assorted ore, valued at \$9,000. It is extremely difficult to form conclusions as to the permanency of these mines, but it is presumable from present outlook that they will be fair bullion producers, and the district holds out good prospective promise for moderate enterprises.

In Spruce Gulch and Bald Mountain districts the sandstones are fully developed; there are very encouraging properties in the former, and some of them are now in paying condition. The most noted is the "Champion," on which is 30 stamps. The "Lexington," "Oro Cache," and many others are regarded very favorably. These ores are free and yield well, about the same as "belt" varies, viz, from \$5 to \$6 per ton.

In Bald Mountain district the mines are more extensive and cover an area of about ten square miles. The "Trojan," "Perseverance," "Portland," and many others are regarded as valuable properties. The minimum and maximum value of these ores is from \$2 to \$500 in gold and \$3 to \$100 in silver per ton, averaging \$25 gold and \$7.50 silver. The silver occurs largely as chloride and bromide, and will necessitate the addition of pans and wastes to the ordinary stamp mill. Concentration would be highly advantageous to these ores, although rendered difficult by the presence of the chloride and bromide silver. These mines are horizontal and very regular in width, averaging over 5 feet.

The porphyry dikes are most noted in the Strawberry district; whole mountains of mineralized porphyry are here found, and the pan test gives fine results from some of the decomposed stratas running in every direction, and from one-fourth of an inch to many feet in width, and would yield \$15 to \$20 per ton by mill, but would yield sparingly from the body of rock.

That portion of Wyoming in which is situate Upper and Lower Sand Creeks, Mallory Gulch, and many small ravines tributary thereto, has furnished thousands of dollars, and is not yet half worked out; this owing to scarcity of water. All the gold found in Upper Sand Creek is derived from quartz veins and cement beds immediately at the head of the creek. This region, including Bear, Beaver, Potato, and Nigger Gulches, has been highly productive and is so yet. Here are many quartz locations, some showing great promise of future productions; few, if any, however, have been developed beyond the requirements of law. The mills upon the "belt" are the largest in America, and are adapted to the treatment of ores by what is known as the "free-milling process," and

this manner of treatment is almost the only mode employed at the present time, other processes having been applied in but few instances.

The large mills are:

Homestake	80 stamps.
Golden Star	120 "
Highland	120 "
Golden Terra	80 "
Deadwood	80 "
Father De Smet	80 "
Caledonia	60 "
Total	620 "
Esmeralda (building)	60 "

These mills have a maximum crushing capacity of 1,700 tons per diem, with a minimum value of \$6.41 per ton. This gross value per ton is taken from the annual statement of the Homestake Company for the fiscal year ending June 30, 1880.

The following shows the relative production of bullion by the companies as compared with all the other bullion-producing sources for the calendar year ending June 30, 1880:

Homestake companies	\$3,784,534 00
Merchant's National Bank	435,899 33
First National Bank	196,366 00
Private parties (estimated)	25,000 00
Manufactured by jewellers	15,000 00
Silver ore shipped	9,000 00
Total	4,455,799 33

The gross shipment of gold via the Sidney and Black Hills Stage and Express Company, for the calendar year of 1880, was kindly furnished by Mr. D. A. McPherson, agent, who states the same to have been \$3,980,900, consigned to Messrs. Lounsberry & Co., of New York, with the exception of the amount shipped by First National Bank, which was consigned to Messrs. Kountze & Bro., New York. The Merchant's National Bank shipped by the Northwestern Stage and Express Company, to Kountze Brothers, New York, as follows:

July 1, 1879, to December 31, 1879	\$261,370 51
January 1, 1880, to June 30, 1880	257,964 46
July 1, 1880, to December 31, 1880	179,934 87
Silver	10,700 00
Total	709,969 84

First National Bank shipped via Black Hills Stage and Express Company to Kountze Brothers, New York:

July 1, 1879, to December 31, 1879	\$230,106
January 1, 1880, to June 30, 1880	106,980
July 1, 1880, to December 31, 1880	89,386
Total	426,472

Homestake Company shipped for fiscal year ending June 30, 1880, \$1,033,272.

Assorted silver ore shipped to Omaha Smelting Works from July 1, 1880, to December 31, 1880, 74 tons, of the assay value of 130 ounces per ton.

The different modes of reduction of ores now in operation in the Black Hills may be summed up as follows:

1st. The free-milling process, which constitutes about 99 per cent. of

the present reduction. This is simply the pulverization of the ore and amalgamation of the gold on copper plates properly charged with quicksilver, and afterwards the amalgam thus obtained is retorted and melted.

2d. The chlorination process, confined to the Florence Mill, Galena district. This mill has a capacity of ten stamps, Buckner cylinders, Miller pans, &c., making it complete with all the latest improvements for chlorination of silver ores.

There is also a smelter of small capacity, designed chiefly for experimental work.

3d. The intermediate between the free-milling and chlorination processes, *vide* the Snow Storm and Portland mills of 20 stamps each, and intended specially to treat the chloride ores of Bald Mountain district, but which have not yet erected their wasting furnaces.

Throughout the three counties of the Black Hills we have the following number of stamps:

Lawrence County	1, 395
Pennington County	220
Custer County	110
Total	1, 625

There is a permanency about these bullion-producing veins that abundantly warrants me in saying the future of the Hills country, as a mining region, is decidedly hopeful.

The veins are of prodigious width, continuous and nearly vertical, rendering the quantity of ore practically inexhaustible, while the value slowly increases as greater depth is attained.

In addition to this promising state of affairs in the mining resources of this region, there are many hundreds of miles square in extent, fruitful to an almost unparalleled degree, inviting the husbandman and capitalist.

From all these various sources there must, through the years to come, be added to the national wealth an ever increasing amount.

Of the mining interest developed and in course of development the Homestake mines are the most extensive, and are at present the most productive gold mines in the United States. The property controlled by the company comprises 1,350 feet of the Homestake and Golden Star and 1,500 feet of the Little Netta claim, and is owned and managed principally by San Francisco capitalists. Nearly \$1,000,000, it is said, have been expended in purchasing and developing the mine, building mills, and adjusting conflicting claims.

The following extract from the Bismarck Tribune shows the manner in which the ore is taken from the mine and run through the mills:

The ore is broken down in the mines, placed on cars, conveyed to the hoisting-shaft, elevated by an ingenious automatic cage to the surface, deposited in large shutes, loaded into tramway-cars, steamed away by a locomotive run on a steel track to the top of the mills, and dumped into large grizzlies made of heavy iron bars, through which the particles of fine ore go directly to the ore-bins, while the remainder goes to the rock-breakers, and thence into the bins. The ore-bins are on an incline, the shape of a roof at half pitch, having an opening at the back of each set of five stamps, the ore passing from the bin to the stamp by its own gravitation. The stamps strike a rubber buffer or bumper in such a manner as to perfectly regulate the feed. The ore is not touched from the time it is placed in the car in the mines until the final clean up, and the arrangement is so perfect that four men on a shift take care of the ore crushed in a 120-stamp mill.

Five stamps are arranged in each battery, twelve batteries being placed on each side. A 300-horse power Corliss engine is placed at the end of the mill and between the two lines of batteries. On the crank-shaft of the engine there is a fly-wheel 20

feet in diameter, weighing 26,000 pounds, in order to give steadiness to the movements of the batteries and rock-crushers.

Connecting with two 32-inch pulleys, 12 feet in diameter, are two lines of shafting extending through the center of the building to its farther end. On each line of shafting there is a 10-foot (32-inch face) iron pulley, and on each pulley a double oak-tanned leather belt, 70 feet long, each driving 60 stamps.

On the belts are iron tighteners in strong frames, arranged with worm-screws, wheels, and universal boxes, making it impossible for the belts to get out of line or become subject to any unnecessary strain.

The batteries of the Homestake mill are placed in double sections of five stamps each, so arranged that should trouble come to either or to the rock-breakers operating therewith, they can be stopped and repaired without slowing-up or in any manner interfering with the working of the mill, indeed without the engineer knowing anything of it.

There are four 54-inch boilers, 16 feet long, in each mill, steam-drums, heaters, &c., and for fire protection six Ludlow hydrants inside the mill and four outside, supplied with 1,000 feet of "star" linen hose.

The hoisting works of the Homestake are supplied with all of the late improvements—flat steel cable, safety-clutches, &c.; and to assure against the possibility of accident safety-cages, covered with a shield or screen, so adjusted that they open and close as the cage enters or leaves the opening, are provided and placed over each shaft.

The gold is melted and assayed in the laboratory connected with the mill, the appointments of which being complete, it leaves the mill in bars ready for the mint.

The pumping works are worthy of attention. A Cornish pump is in use. It is 12 inches in diameter with an 8-foot stroke, and is operated by a low-pressure Corliss engine, with a capacity of pumping 800 gallons of water per minute. The main gear is 15 feet in diameter, 15 inch face, and weighs 30,000 pounds. It was cast in sections in order to get it into the Hills. The walking beam is made of the largest timber to be found. It is 26 inches thick, 36 inches wide, and 35 feet long, and there is placed on it 15 tons of cast and wrought iron. It rests on a foundation of cut stone, laid in cement, 22 feet deep.

After the Homestake the Father de Smet is the most productive mine in the Black Hills, followed by the Golden Terra, Caledonia, Deadwood, Deadwood Terra, and Highland.

The great value of the mines of the Black Hills of Dakota is not in the richness of the ore, but in the large bodies of low-grade ore, varying in width from 5 feet to 200 feet and over, and of great depth, averaging about \$7 per ton.

The ore is soft and each stamp will crush on an average two tons a day at a cost not exceeding \$2.50 per ton.

Father de Smet.—This mine crushed last year 90,754 tons of ore, returning an average of \$7.17½ per ton, and bullion valued at \$600,011.97. The total expenses of mine and mill for the year were \$313,108.62, giving a profit of \$286,893.35.

In order to work the large gravel beds found in the gulches it was necessary to construct ditches and flumes to convey water from a distance.

For a time it was believed that only gold was to be found in paying quantities in the Black Hills, but veins of silver and galena have been found, and mills and works erected for the reduction of the same.

The following mines have reported: High Lode, Homestake, Milwaukee and Black Hills, Golden Terra, Deadwood, Highland, Giant and Old Abe, Caledonia, Clara Consolidated, Florence, Elrefago, Gold Finch, Durango, Last Chance, Gopher Consolidated, Father de Smet, and Patton. Their production was: Gold, \$2,905,204; silver, \$26,931; total, \$2,932,135.

The gold production of Dakota has increased to a larger proportionate extent than that of any other State or Territory. The estimated amount of both gold and silver for the fiscal year was \$3,600,000 in gold and \$75,000 in silver. As railroads are projected and being constructed the yield of its mines will doubtless be increased.

The following extract from the Deadwood Press of December 31, 1880, exhibits the activity displayed in the development of the Dakota mines :

Activity in all sections of the Hills in opening up new mines and developing old ones has marked this year of labor. Of the new mills erected the following is a full list :

	Stamps.
Lead City:	
Highland.....	120
Terraville:	
Caledonia.....	60
Strawberry Gulch :	
Sunday mill.....	20
Spruce Gulch:	
Lexington.....	10
Champion.....	30
Bald Mountain:	
Portland.....	20
Snow-Storm.....	20
Rochford District:	
Minnesota mill.....	20
Charter Oak.....	10
Irish Gulch.....	20
Stand-By.....	60
Tigerville:	
Queen Bee.....	10
Hartford.....	10
Grand Junction.....	20
Penobscot.....	25
Hayward:	
Hayward.....	10
Total.....	465

This makes a total of 1,690 stamps in the Hills, 1,400 of which are located in this section and the others in the southern. The coming year will probably witness the erection of a number of large mills, one on the De Smet mine at Central City of 100 stamps, and another one for the Gopher mine in Bobtail of 100 stamps, and one or two 100-stamp mills or one 200-stamp mill at Lead City, all under the direction and control of the Homestake company.

Deposits of gold and silver from Dakota at mints and assay-offices, from July 1, 1878, to December 31, 1880.

Six months' periods.	Philadel- phia.	San Fran- cisco.	Carson.	Denver.	New York.	Boise.	Total.
GOLD.							
July 1 to Dec. 31, 1878	\$34,403 51	-----	\$2,121 10	\$3,109 73	\$1,163,075 84	-----	\$1,202,710 18
Jan. 1 to June 30, 1879	9,418 38	-----	-----	1,849 98	981,276 73	-----	992,545 09
July 1 to Dec. 31, 1879	-----	\$64,350 06	-----	-----	1,379,313 02	-----	1,443,663 98
Jan. 1 to June 30, 1880	971 58	-----	-----	-----	1,305,386 53	-----	1,306,358 11
July 1 to Dec. 31, 1880	205 04	-----	-----	9,602 02	1,879,814 67	\$208 78	1,880,830 51
SILVER.							
July 1 to Dec. 31, 1878	-----	-----	17 00	-----	-----	-----	17 00
Jan. 1 to June 30, 1879	-----	-----	-----	-----	-----	-----	-----
July 1 to Dec. 31, 1879	-----	-----	-----	-----	-----	-----	-----
Jan. 1 to June 30, 1880	-----	-----	-----	-----	21,104 54	-----	21,104 54
July 1 to Dec. 31, 1880	-----	-----	-----	116 54	-----	4 44	120 98

Bullion production of some of the mines of Dakota as reported to and published by the Mining Record of New York.

Mines.	July 1 to December 31, 1879.	January 1 to June 30, 1880.	Fiscal year 1880.	Calendar year 1880.
Caledonia	\$31,850	\$22,100	\$53,950	\$102,422
Deadwood	20,500	-----	20,500	72,000
Deadwood Terra	-----	-----	-----	75,000
Father De Smet	-----	277,730	277,730	277,730
Giant and Old Abe	2,750	-----	2,750	-----
Golden Terra	135,500	153,300	288,800	188,300
Gold Stripe	2,650	-----	2,650	-----
Highland	2,700	-----	2,700	-----
Homestake	396,570	300,400	696,970	1,239,600
McMillen	6,779	-----	6,779	-----
Total	599,299	753,530	1,352,829	1,955,052

ALASKA.

The following is from the Mining and Scientific Press, of San Francisco, and may be of interest in regard to the northern extreme of the United States:

While the southern Territories of the United States are just now attracting a large share of attention from the mining community, the northern Territory of Alaska is also putting forth its claims as a mining region; and it is probable that the coming summer will see many prospecting parties in the field. Last year there was considerable prospecting done, but the winter, of course, stopped work generally. It has been somewhat difficult to get any reliable news from the various camps which are being opened, and reports have been somewhat conflicting. We have received, however, from Mr. George E. Bilz, who is now at Sitka, a letter in which he communicates considerable information of interest concerning the mines; and as he has evidently personal knowledge of the matter, his statements are more direct than any we have received. Mr. Bilz's letter is as follows:

EDITORS PRESS: I think it probable that as you have not heard for a long time from this part of the coast (Sitka), a few notes in regard to certain newspaper reports may be of advantage to the readers of the Mining and Scientific Press. During the past summer, feeling confident of the mineral wealth of Alaska, I fitted out seven different parties to prospect, each with six months' provisions and equipments. I also paid each party, which consisted of five or six men, regular wages, as otherwise I could not expect to have the prospecting of the country done to my own satisfaction.

The last of the seven parties returned in the latter part of November, and brought here to Sitka, on a canoe, about two tons of the richest quartz I ever saw in any country. I went up to this new El Dorado, leaving here on the 25th of November, and arrived there, on a canoe, on the 29th of the same month.

The district is called after the discoverer, "Harris district," and is situated on the mainland of Alaska, between the Takou and Chilcat Rivers, in 58° 28' north latitude and longitude 134° 10', within four miles of Stephenson's Straits, opposite Douglas Island, on the northern end of Admiralty Island.

The discoveries of the ledges and placers were first made on Gold Creek, but since traced and found in Salmon Creek and Glacier Creek, 5 and 7 miles northwest respectively, and in Sheep Creek, 3 miles southeast. The same ledges and ores were found 30 miles southeast, and in Windham, Spruce, and Sehug Creeks, where, for the last five years, the placers have been paying well to a small lot of men. In Gold Creek and its tributaries some 60 claims are now already taken up and staked out, and on all very encouraging prospects have been found. They may be called \$5 to \$20 diggings. But very little can be done there before April or May, as the men are not prepared to work yet, and are only getting ready and prospecting their grounds.

THE LEDGES.

The ledges which made these placers are at the head of the creek, and cross the creek twice in a distance of about 2 miles. There is but one belt of them, which is

about 3,000 feet wide, and in it the six main ledges run parallel to each other, besides a number of smaller veins, but which are taken in by the main locations, as those are only about 300 to 500 feet apart, and are from 6 to 30 feet in width. These lodes, which show bold cropping for over 3 inches (so far as I have been on them), hold very regular in size and distance apart, and the whole length shows the richest kind of ore. The quartz is imbedded in soft slate, and is quite decomposed and brittle. The gold is mostly free in the quartz, but the richest ore is in the galena, which is the only disadvantage of the ore, as I expect it will interfere with the amalgamation; yet the gold is quite coarse and very heavy, so that it will readily concentrate with the galena to be smelted there. I have made upward of a hundred assays, both fire and wet, and the lowest assay out of the very poorest piece of quartz yielded \$33 per ton, while the average of my assays which might be also called average of the ledges, are \$285 per ton, and run from \$100 to \$5,000 per ton; and then I have never yet assayed any specimens.

The ledges were respectively called the Jamestown, Takou, Pilz, North Star, Montana, California lodes, and on each there are claimed already six locations of 1,500 feet each, with plenty of ore on all of them. In the creeks lay thousands of tons of the richest kind of ore, every piece of which shows the gold plainly, and a good many of the placer claims are valuable for the quartz which lies on them.

WATER IN THE CREEKS.

There is an abundance of water in the creeks as they are fed from eternal snow banks high up in the mountains, and there were on the 15th of December, all of 3,000 inches running, which is the lowest water of the year. There is nothing to prevent working these mines the year around; as, so far as this (January 18) in the season, we have had only six days of frost, and now there is no snow as far as 1,000 feet above sea, and it rains a good deal, of course, in the high mountains. It snows in the higher mountains.

The country is thickly timbered with red and black spruce, black pine, hemlock, alder and red birch, not so tremendously thick as on the island, as there is 100 per cent. more moisture on the archipelago than on mainland.

The way to it is very easy and any large vessel can sail to the mouth of the creeks and anchor within 200 feet of the shore. Already I have a 150-ton steamer up there, taking up my men and supplies, and by the middle of February I expect to have the mail steamer California running up there with lumber and supplies. Outside of this district one of my parties found a silver ore district between Lynn Canal and Youiatate and Hoonah Island. The ore they brought from there is most encouraging. They brought some chloride and some bromide silver ore which is quite high grade, and they claim to have plenty of it. They also bring samples of argentiferous galena, from a whole mountain of the kind, which yields 40 per cent. lead and \$25 to \$60 per ton in silver.

Another ledge they report quite large, the samples yielding from \$30 to \$120 in silver and \$60 to \$100 in gold. They report also and bring fine samples of copper-silver glance, antimonial silver, and sulphurets of copper, in large quantities. This is called Morrisana district, and I shall visit it early in the spring in the United States naval steam launches. I must not forget to give due credit to Commander Glass and the other officers of the United States ship Jamestown for their ready assistance to us prospectors, they having done everything in their power to further our efforts.

MINES OF THE APPALACHIAN RANGE.

During the year considerable attention has been attracted to the mines of the Southern States, and a fresh impetus has been given to the mining industries of Virginia, the Carolinas, and Georgia, more particularly the latter State. The cheapness of labor, fuel, and timber for mining purposes, as compared with the same in remote sections of the country, permits the working of much lower grade ores, and with the revival of all industries that of gold mining seems to be keeping pace.

The production of these States during the fiscal year was about a quarter million of dollars.

To Mr. George B. Hanna, of Charlotte, N. C., I am indebted for the

following description of the mining sections and mines of North and South Carolina and Georgia:

NORTH CAROLINA.

On the central belt of North Carolina, comprising eleven counties in part, and covering a territory 100 miles long, and, on an average, 15 miles wide, vein mining only is undertaken. The placers have long since been exhausted, with the exception of very small and unfavorably lying patches, which admit of unimportant operations only.

I commence the enumeration towards the northern limit of the State.

The mines at work are the Fentress and the Gardner Hill, in Guilford County, but the operations are on a small scale. Both these mines are old ones, and are reopened at points, but much of the work has been spent on the old tailings and the low-grade ore rejected in the former operations.

The Conrad Hill mine, with an old history, is now in the process of reopening, and on a scale which promises to place it among the producers of bullion in the near future.

The Allen mine and the Eureka mine, near Thomasville, in Davidson County, have also been worked to a small extent, but the result of their operations has added little to the bullion product of the State this last year.

At the Silver Valley mine, near Thomasville, the operations are confined to developments, and there seems at present little disposition to mill the ore, although a 10-stamp battery is at hand ready for work. The dump contains a heavy amount of ore, which is largely iron pyrites with galena, both auriferous and argentiferous. Not unlikely the ores will require a smelting treatment, in which case the gold, silver, and lead will go out of the State for treatment as base bullion or matte.

The Silver Hill mine, near Lexington, has been one of the most extensively worked mines in the State, and, with one exception, the deepest. The ore is a refractory galena and blende, with a little silver and a trace of gold.

A considerable body of ore has been mined during the last two years, but with the exception of some shipments abroad for treatment little work has been done looking to the extraction of the valuable constituents; legal troubles have also impeded operations. The ore is troublesome to treat even by smelting, which is the best method applicable. A smelting establishment on the spot is a necessity, as the ore is too low grade to bear much transportation. It is likely that the gold and silver with the lead will go out of the State for treatment in the shape of base bullion.

Lead ores, however, are very rare in this State, and as they are indispensable in certain kinds of metallurgical operations for the extraction of gold and silver, it is possible that the ores of the last two mines will be in demand in the establishments now in operation or hereafter to be erected, but no extensive use in this direction is likely to be made in the near future.

About Salisbury, in Rowan County, are numerous mines, which would doubtless be worked if the conditions of the metallurgical industry of this section afforded a reliable and good market for ores. This district has been less developed than most of the others of the State. At present only four mines are at work.

At the Dunn Mountain mine, 3 miles east of Salisbury, the company have been content to develop before erecting mills; 1,500 or 2,000 tons of ore are on the dump, and the underground works are extensive enough to furnish a moderate supply for constant operations. This ore has considerable iron pyrites and some copper pyrites, but is for the most part brown oxide of iron with quartz and slate; at greater depth the pyrites will be found in larger proportion in all probability.

The Bullion mine, 3 miles farther east, is worked with the same policy, but the amount of ore is not large, nor are the underground works as yet extended enough to furnish a constant supply of ores for daily work; the shaft is sunk to the depth of 90 feet, the ores are much like those of the Dunn Mountain, but contain less copper; apparently developments are constantly going on.

The Rhymer mine, between the two, was opened in September last; the shaft is down about 70 feet; the vein is wide, and the ore body reputed good; it yields ores like those just enumerated. At present it sends its output to the reduction works near Salisbury, and its prosperity is likely to depend on the success of that establishment.

The Yadkin mine, 2 miles south of Salisbury and adjacent to the reduction works, is operated by that company to supply ores for its own use. It was stated to me that several tons of ore were furnished daily, but no figures were given.

The Rendleman, the Hartman, the Rouman, the Holtzhauser, and the Haynes mines, near Salisbury, have shut down for the season, as no sufficient inducements were offered to keep them in operation; no great depth has been reached in any of these; they are not accessible at present, and were covered with a heavy snow at the time of

my visit to the neighborhood; they bear a good reputation in this vicinity; the ores shown me were good, and much the same in character as those obtained in other mines in this section. The best informed men in Salisbury could give me no opinion whether they would be operated the coming season.

The Gold Hill mine, 15 miles southeast of Salisbury, although not on the central belt, is so intimately connected with it as to claim attention here. This has been the most extensively worked and the most noted mine in the South, having reached a depth of 735 feet. It is not worked now, except in a petty way, and chiefly by a retreatment of the old tailings, of which there is a large amount. I can hardly doubt but that this old mine has still good bodies of ore in it, but there is no disposition to develop them at present.

The operations of this section cannot be dismissed without an allusion to the Davis and Tyson metallurgical works near Salisbury, to which allusion has previously been made. They are situated 2 miles south of Salisbury. A large plant covering at least one-fourth acre, has been erected, and supposed to be capable of treating 10 tons per day. The method is essentially one of chlorination, but under conditions not hitherto practiced. The licensees of this establishment claim to have worked out the details of a thorough and economical method of extracting the gold, but the superintendent in charge declined to give me any data. It has been in operation but a few weeks; should it be successful, it would without doubt be enlarged, and afford a powerful stimulus to mining within as great a radius as transportation would allow the ores to be carried with any profit to the miner.

In the next county to the south, Cabarrus, the mines have not been worked to any important extent during the year, but some small operations have been entered into; the ascertained returns have not been large.

Chlorination works have been recently erected at Mount Pleasant; the superintendent states it to be successful in its work, but only general statements have been given to the public.

If the anticipations are realized many mines in this and the adjacent counties would be operated to supply him with ores which are too refractory to be treated with the appliances now in use.

With a very few exceptions the best known mines are situated in the next southern county (Mecklenburg), of which Charlotte is the county seat; three mines only are in operation.

The Rudesil mine, 1 mile south of Charlotte, is credited with a production of \$1,000,000. At present the depth is a little more than 200 feet and the lowest level 190 feet. This mine is capable of turning out large bodies of ore suitable for milling, and a fine grade of sulphurets (chiefly of iron) adapted to a smelting treatment, of which latter class a considerable quantity has been shipped to Northern smelting works. The shaft has recently been sunk deeper to allow the running of a new line at a greater depth; good ores have already been found, but to what extent has not been proved. From repeated visits to the lower level and a careful examination of the formation I have little doubt that several chimneys of shoots of good ore will be found. The mine is worked by a 10-stamp battery. In this mine, as in most of the others of this vicinity, there is an increasing proportion of sulphurets as greater depth is reached, and an increasing difficulty in treating them by the mills in use, and a less and less proportion of the gold is obtained.

The Ray mine, 7 miles east of Charlotte, is in process of reopening. As this mine had many years ago a good history and a large production, something may reasonably be expected from its operations the coming season.

The Simpson mine, 10 miles east of Charlotte, is now developing; but the company prefer to "open up" before erecting mills for treating the ore. A large amount of underground work has been done and considerable ore brought to the surface. I have no means whatever of knowing whether it is likely to make any gold the coming season.

The Dunn mine, 10 miles west of Charlotte, has been worked a little during the year, but the work has been more that of exploration, and the gold produced has been small. The same statement applies to the McGinn mine and the Ferris mine. The latter mine is not unlikely to be opened permanently.

Some other mines have been prospected, but without important results.

The New York and North Carolina Reduction Works, located at Charlotte, commenced work about six months ago; but the amount of work done to this time has not been large, as the supply of ore has not come in rapidly. Efficient and economical work on its part would in time stimulate the output of ore. Much of its product, however, would go out of the State as argentiferous and auriferous matter or base bullion. No one outside of the works knows how much bullion has yet been produced.

There seems to be some disposition to erect two other metallurgical works in or near Charlotte, but the method of treatment to be adopted is not known.

Negotiations are also pending looking to the reopening of two other mines in the vicinity of Charlotte; but if all these projected operations should be carried into effect, the greater part of 1881 would be spent in the preliminary work, and the bullion product could not be appreciably affected by them this season.

The Sherman mine, the probable extension of the Rudesil, has been recently opened to the depth of 60 feet and levels run. The ore extracted is reported good, but the work is too recent and too little developed to justify any confident statement of its probable relation to the ore-supply of this section for the present.

In the western belt of North Carolina the King's Mountain mine, in Gaston County, is the only mine now worked to any important extent. This mine has been very productive. It is worked at a depth of 320 feet. The ore is impure limestone, with a small percentage of galena and blende, iron pyrites and copper pyrites, and other rare minerals in very small proportions. There are two veins or ore-bodies, the front body being worked at present. This body ranges from 11 to 15 feet in thickness. The whole material is low grade; but as it is cheaply mined and easily milled, and has but a trifling proportion of refractory sulphurets to lessen the yield of gold, it can be worked at a profit at figures which, with most of the other kinds of ore, would barely suffice for mining and hoisting. It is provided with four double batteries and other machinery capable of treating 60 to 80 tons per day. On the whole, it is the most completely-equipped establishment in the State.

Some work has been carried on at the Long Creek, the Duffie, and the Robinson mines, but the production has been small. They may be operated again the coming season, but they are not likely to have a heavy return.

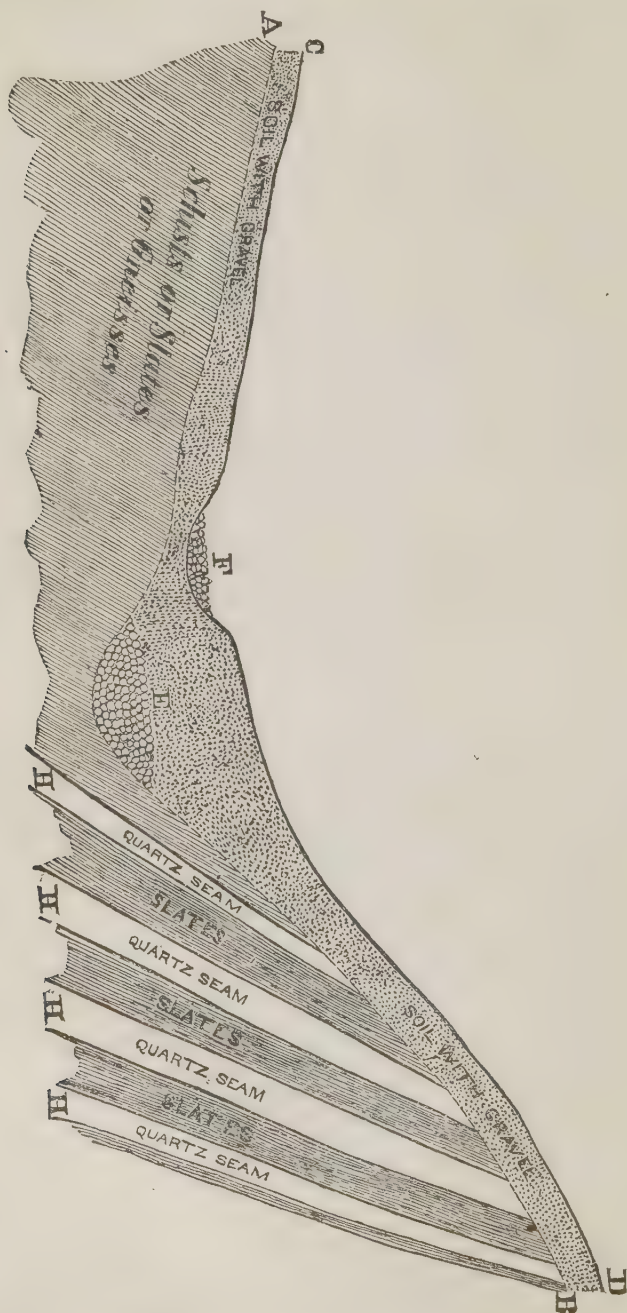
The "gravel" mines of this western section have attained a great celebrity in this State. They are for the most part in the mountainous sections of Western North Carolina. The extent of these deposits has never been determined accurately, for only those placers have been worked which were easily got at and to which water could be easily and cheaply brought, viz, the shallow valleys and adjacent slopes of little elevation.

At the Shuford mines, in Catawba County, which for many years have been worked in an easy way, an enlarged plant is now in process of erection, and will probably be in operation in the spring. The gravel of this mine, though not of so great extent as in some other places, is good and abundant enough for a long period of work.

In Watauga, Caldwell, and Buncombe counties are small areas, which are occasionally worked. The Cherokee County deposits extend into Georgia. The Jackson County gravel is worked a little, although Georgetown Creek is credited with a production of \$250,000.

The most noted area is that where Burke, McDowell, and Rutherford Counties come together; an exact survey would probably show 250 square miles of these deposits—a strip of territory from 15 to 20 miles long, from northeast to southwest, following the general course of the mountain ranges, and 10 or 15 miles wide. The Polk County deposits, some 25 miles to the southwest, may be an extension of this area. Almost everywhere in these limits auriferous material is found, but only in a few places in paying quantities. As the processes are made more economical and efficient, the paying areas will be more numerous. Brackettstown, Jamestown, Brindletown, Dysartsville, and Whitesides are the best-known localities. The gold hitherto extracted has been from the gravel exclusively. Its ultimate source has never been satisfactorily ascertained, but as rich gold-bearing quartz has often been found with the gravel, it apparently came from the innumerable seams of quartz which everywhere traverse this section—seams rarely more than 6 inches thick, and usually not more than 1 or 2. Half a dozen seams are sometimes seen within the distance of 100 feet. They often carry a small proportion of sulphuret of iron, occasionally a little copper pyrites, with a somewhat larger amount of peroxide of iron. This locality, in common with the whole of the Carolinas and Georgia, has undergone extensive alterations and decomposition and subsequent wearing or drifting down, by which the gold has been left in the surface soil, and more largely in the bottoms of streams both ancient and modern. The old streams and basins receiving the ancient drift and wash are the richest depositaries. They are usually of no great length or breadth, but oftentimes are quite numerous.

The annexed diagram will show the relation of the hills and veins to the old and to the new streams:



The line C D represents the present surface of the ground; the dotted line A B represents the old surface of the ground; E represents the bed of an old stream filled with auriferous gravel; F represents the bed of a new stream partly filled with auriferous gravel; H H represent seams of quartz, the supposed source of the gold. The soil some-

times lies above the beds of these old streams to the depth of 30 feet. It will readily be understood that the operations of the past, when little capital was employed and little apparatus, were necessarily confined to such deposits as lay near water or to which water could easily be brought. The greater part of these accessible places was long ago exhausted, and the work of the future will be on those deep-lying gravels (often-times extremely rich) which require expensive digging to remove the overlying soil, or else a heavy and powerful stream of water to wash it away. The sides of these mountains will also supply a share of gold when water can be had to work them. A supply of water in abundance and with a powerful head is the important question in every enterprise of this kind. This supply is obtained in two ways: First, by the action of powerful pumping apparatus which shall give pressure answering to head. This method is so costly in its establishment and in its continued operation as to prevent its adoption except in a few favored localities. Second. By tapping the streams higher up towards their sources, and conducting the water by ditches along the ridges or by flumes, and applying it with as great a head as possible at the desired point. The cost of the necessary aqueduct is generally large at the outset, but the expense of operation is slight.

As this mountain section is well watered and traversed by numerous streams, there is not likely to be a deficient supply, when the conformation of the ground allows of an aqueduct of simple construction, and without expensive tunnels or trestles. The smaller operators draw their water from the streams in immediate proximity to the working places, and of course suffer all the inconveniences of drought, which, as in the last two summers, impedes operations during the most favorable season for work. The number of these operators is considerable, and this class of work is likely to be carried on for some years yet, if the present low prices of wages (30 to 75 cents per day) are maintained, since mining allows of such a return, though either agricultural or mechanical pursuits if steadily followed would in the end be more remunerative.

The product of this area is probably not less than \$30,000 per year, and in seasons when water is abundant will exceed this. Only two large mines are in operation.

The Brindletown property under the management of I. C. Mills, of 2,300 acres, is operated by a ditch of 4 miles in length, and will soon have another of 9 miles in operation; the latter gives a larger supply of water, and with a greater head. The extent of rich gravel underlying this property is estimated to be not less than 100 acres, and may easily be much more.

Colonel Mills's work is likely to be on a larger scale the coming season.

The Granville Mining Company at Brackettstown, has upwards of 1,500 acres in its mining tract. Its ditches, as reported to me, are 20 miles long. At present they work with a head of 60 feet of water. No determination has ever been made of the extent of the rich gravel on the tract, but the concurrent reports of all familiar with the property indicate it as considerable. The company should produce considerable gold the coming season if the work be diligently pursued.

The Vein Mountain Mining Company at Janestown, 8 miles south of Marion, on the Western North Carolina Railroad, has a tract of 6,800 acres, and there is nearly constructed a ditch of 6 miles in length; the head of water is calculated to be 150 feet.

No survey of the extent of auriferous gravel has to my knowledge been made on this property, but there is little doubt that it is considerable. I see no reason to doubt that this property will early in the season be added to the list of producing mines in North Carolina.

I am informed that three companies have just laid their plans for work in Munford Cove, about 7 miles southwest of the above mine, and one company, the Hancock, has just commenced work in Glen Alpine to the southeast; two companies are negotiating for properties in the valley of the Second Broad River, and in the neighborhood of the Verris Mountain. All the signs point to a season of greater activity in this section the coming year.

The history of these mines in McDowell, Burke, and Rutherford Counties goes back to 1828-'29; at times there have been as many as 3,000 men at work at once in washing gravel. As no statistics have been kept, the production is not known, but those conversant with the work done there place it at several millions. The resources are still ample to give constant occupation to mining companies for generations to come.

In the eastern belt of North Carolina the formation is slate, sometimes argillaceous, sometimes talcose and chloritic, sometimes micaceous, and occasionally hornblendic. At present but few vein mines are operated; the chief localities operated are worked in "gravel."

The Jones or Keystone mine, 15 miles nearly east of Thomasville, has been operated during the year to some extent by means of a mill, but at present work is suspended to allow the erection of a plant. The intention is to treat the ore by a recently invented French process.

The formation is the most curious I have ever seen. The tracts owned or controlled by the company comprise 293½ acres. There are probably some veins on the tracts,

but the peculiar feature is that the greater part of the property is one vast body of ore to the depth of 20 to 40 feet. The formation is the ordinary talcose and chloritic schist of the section, highly decomposed to the depth stated, and everywhere highly stained by peroxide of iron, in some cases apparently the result of infiltration, and in others evidently the result of decomposition of sulphuret of iron, which in some places can be found in some quantity finely disseminated in the schists.

From many assays made from samples taken by myself from many and widely separated points I think most of the material contains gold to the extent of \$2.50 per ton, with occasional chimneys carrying ore of much higher grade. As the surface is quite rolling and everywhere cut by ravines, the ore is mined by open cuts after the fashion of quarries. The material is soft enough to be easily crushed by the hands, so that mining is extremely easy and cheap; and as the conformation of the surface allows the use of gravity tramways the ore can be put in the mill-house at an expense of a few cents per ton. The supply of water is, however, very deficient, and the want of a good supply has seriously hindered work; otherwise the property would be a very valuable one. What will be the yield of the mine in 1881 I cannot say, even should the sanguine expectations of the patentees be realized; still many months would necessarily elapse before it could be so perfected as to allow of continuous work. Other tracts in this vicinity of the same character lie in a dormant condition, but would doubtless feel the stimulus of success in this.

The Russell mine is worked only in a tentative way. The deposit of ore is very great, but it is of low grade, and is sufficiently heavily charged with sulphurets to give much trouble in working.

At the Eagle mine, in Moore County, some work has been done during the year, but I am informed very intermittently and with small result. Some propositions have been made looking to better work the coming season.

The Houston mine, near by, has been, and still is, worked, and, as reported, with a moderate return.

The time at my command did not allow a visit to either of these mines.

The Washington mine, in Union County, carries a body of tough argillaceous schist; it is an old and long-abandoned mine; the work done here the last season was very general, but some very good ore was mined; the production of gold was small.

At the Howie mine, near by, a mine of the same character, no work of importance has been undertaken during the last season, but some of the refuse ore, and the old tailings, have been re-treated, and a small amount of gold extracted. There is no indication at present of any change at this mine.

The Beaver Dam mine, in Montgomery County, is 30 miles nearly east of Salisbury and near the Yadkin River. The property comprises 800 acres, of which nearly one-half is claimed to be underlaid by gravel. The time at my disposal did not allow an extended examination of this gravel, but I was assured by persons familiar with it that it is of good quality. It is covered by an alluvial deposit of 5 to 15 feet, and is itself from 2 to 4 feet thick. I could not learn that any vein was known on the property. It is worked exclusively as a hydraulic mine, the water for which is furnished by the Beaver Dam Creek, it being thrown directly on to the gravel by a Davidson pump, which seemed to me entirely too light for its work. The company has been in a condition to work for a year, but has made only 1,000 dwts. of gold (about \$900 in value) in the time. I was assured that the gravel produced at the rate of 60 cents per square yard of bed rock uncovered, which I think quite possible. It appeared to me that material of this character, and so easily accessible, should have justified the expectation of a large yield. What obstacle prevents a successful working of this property I can only conjecture. The production for 1881 is entirely uncertain.

The Sam Christian mine, in the same county, and 42 miles nearly southeast of Salisbury and 3 miles east of the Yadkin River, has had a famous history, and the present operations show that its resources are far from exhaustion. The place is worked only as a hydraulic mine. At present two old streams are under process of uncovering. The gravel of these old streams is sometimes overlaid by soil to the depth of 30 feet, but is always good. A curious fact about this mine is the absence of gold in small grains, and its occurrence in nuggets. The lack of water in summer allowed only 120 days' work in the year 1880; but in this time upwards of 4,200 dwts. of gold were obtained, in pieces varying from 5 dwts. to 1,024. The entire production was 4,400 dwts., valued at a little more than \$4,000. The returns of this mine will be rather intermittent—a long period of work may be undertaken with a comparatively small result. Again, a “sink” in the bottom of the old stream may at any time be uncovered which will yield an immense return. For this reason no estimate can be given of the probable yield for 1881, though there seems no reason why the return should not be greater than during the last year, as more work will be done, and as the mine is better opened. I do not regard \$12,000 as an unreasonable amount to expect.

The Crowell mine, in Stanly County, 23 miles from Salisbury, has been suspended during the season, but will soon be at work again. It was filled with water at the

time of my visit, and inaccessible. Vein mining only is followed. There was no responsible person present at the time of my visit, and I could get no information of the amount produced, or of the extent or value of the ore; the production has not been large. The ore, to appearance, is of only fair grade, though it is within my personal knowledge that the mine has produced very rich ores. The material is easily treated, and, if it exists in as large quantity as claimed, the mine should produce handsomely. The mill is provided with a battery of three stamps, and some crushing apparatus, as yet untried here. With an adequate supply of ore the yield should not be less than \$1,000 per month.

The Portis mine, in Nash County, is so remote that I found it impossible to visit it. I am informed that little is done. Hydraulic work only is carried on here.

In Polk County, gravel mining is carried on at the Prince mine and the Double Branch mine. Neither of these companies has done a large business, but the work has been carried on very prudently, and in both cases a profit is claimed from the operations. The individual operations in this county have been too small for special notice.

Any effort to estimate the present production of North Carolina is difficult, inasmuch as several producers of bullion have shown a reticence in answering questions. The records of the assay-office at Charlotte show deposits amounting to \$57,092.14 in 1880, but the entire product of the State did not pass through the office.

I feel it proper to add a few particulars, which my position has enabled me to obtain, respecting such amounts as may pass directly to New York or Philadelphia.

One of the largest operators in the mountain counties sent three remittances during the last year to New York, which, from the weight, must have been worth not less than \$5,000. The testimony to this effect is nearly conclusive. The smaller remittances made by him I am not informed of.

Another operator of my acquaintance has sent all but a fraction of his gold to Philadelphia. He declined to give any statement, but from the number of hands employed and the rate of return, I deem it certain that his production could not have been less than \$5,000.

The Beaver Dam Company and the Sam Christian Company, in Montgomery County, have produced \$5,000, which was sent to Philadelphia or New York.

Another producer in Gaston County admitted to me shipments in the last six months of the year of \$5,000. Twenty thousand dollars is thus unofficially traced. Beyond this point all is conjecture.

One of the largest buyers of gold in McDowell County, and other large buyers in Caldwell and Cabarrus Counties, as well as several of the smaller buyers in these and other counties, have sent directly to their correspondents in New York or Philadelphia. These sums may amount to \$20,000.

Production officially traceable	\$57,092 14
Production unofficially traceable.....	20,000 00
Production conjectured.....	20,000 00
Total	97,092 14

I should feel no confidence in any statement beyond this amount.

The last two summers have been unusually dry, and hydraulic mining has been seriously hindered. In ordinary seasons I think the production from this source would have been \$20,000 greater. The severity of the present winter has prevented work for nearly three months.

As regards the production in 1881 another source will be added, viz, metallurgical works; but I do not anticipate any large addition from this species of work, as the establishments are new, and the methods as yet to be fully applied and perfected, and the conditions of healthy development still to be proved. There is, however, an ample field for successful work.

In vein mining some veins are likely to make an increased yield, others less; the average return will probably be maintained.

Hydraulic mining will be largely developed, and promises to make a considerably larger return. A reflection or two may not be improper at this point.

There is now less tendency to engage in mining for speculative ends, and investments are made at more moderate prices and more generally at first hands. The work is done with more skill and greater economy, and investors see more clearly the nature and condition of work here; there are no bonanza mines of enormous extent and richness, and the mineral resources of the State justify only moderate investment in individual mines, promise only moderate returns, and will net only a moderate per cent. of profit.

The omission in this report of the names of well-known, but at present unworked, mines, is not to be construed as an admission of worthlessness; only those are alluded to which are actually producing gold and silver, or are likely to do so soon. Even those mines are omitted where the precious metals go from the State in the shape of matte or base bullion.

SOUTH CAROLINA.

Most of the general conditions, mentioned under mining in North Carolina, apply with equal force to South Carolina, for most of the formations are the same, and the same industrial conditions exist.

Vein mining is conducted at only two places, and most of the work is of a hydraulic character. The work is not so extended as in North Carolina.

The Brewer mine is located in Chesterfield County, South Carolina, 29 miles nearly south from Monroe, the nearest railroad station in North Carolina. The tract comprises 915 acres, and is almost entirely situated at the summit of a hill 216 feet high, around which, on two sides, are bold creeks, affording an abundant supply of water. In this mine, there is no vein in the usual sense of this word; at present only "gravel" is worked. The hill is cut by several gulches, which are rich in this material; geological changes have distributed this more or less through the surface soil, and on the bed rock of apparently old streams. There are several places where the deposits of this character are extensive. Accurate surveys of this ground have not been made, but there cannot be less than 100 acres. The recent work has yielded \$1 per square yard of bed rock uncovered. The gravel is easily treated, and easily removed down the ravines when exhausted. There is another curious body of auriferous material on this property, which has proved a puzzle to mineralogists and geologists. I refer to an enormous mass of fine white or slightly stained sand, so loosely aggregated that much of it can be easily pulverized by the fingers. It is traversed irregularly by masses of horn-stone or agatized quartz, bearing fine iron pyrites, &c. This material is everywhere auriferous. It has been worked in an irregular way for thirty-eight years, being let out in small tracts for toll, and is pitted with old shafts and pits sunk, wherein the material is richest, and to such a depth as the loose material would allow without the expense of timbering; the depth reached varies from 15 to 150 feet (as reported in one shaft). Everywhere the same soft material is found. No determination of the limits of this body has as yet been made, but from the outcrops found at widely distant points there must be several hundred acres. The larger part of this body is admirably fitted for hydraulic treatment, and would furnish sufficient ore for an enormous plant and a long period of time. It lies very conveniently for exploitation, and is so situated as to allow the easy and cheap removal of the tailings. The supply of water is the most important consideration here. The whole mine being so high above the surrounding country, the sole means of supplying it is by pumping apparatus. A powerful establishment is now in operation, capable of supplying 1,000 gallons per minute, which is thought to be adequate to the uncovering of 100 square yards of bed rock per day. The work is carried on with unusual efficiency and economy. There is a probability that the means of working it will be enlarged. The last work performed gave a yield of \$100 per day. A return of \$18,000 to \$20,000 may reasonably be expected during the present year.

The Haile mine is situated in Lancaster County, South Carolina, 10 miles west of the above mine, and 30 south of Monroe, N. C. The property, comprising 1,805 acres, is one vast bed of talco-chloritic and micaceous schist, with alternations of siliceous schist. Though the work here has been carried on for a long term of years, little impression has been made on the ore bodies; deposits are found at widely separated points, and worked for the most part as simple quarries. The ore masses are simply the schists of the country more highly charged with mineral matter; they are lenticular in shape, and with a width varying from 6 to 60 feet, and alternating with heavy bodies of nearly pure iron pyrites, sometimes 8 feet thick. Underground mining is conducted at only two points, in both of which the veins are wide; the "Blauvelt" vein in particular shows a body of ore 28 feet thick, and of a superior quality. It is impossible to state the extent of the ore resources of this property, since the ample stores ready at hand have done away with the necessity of either exploration or development; the geology of the place appears to me to warrant the expectation that other bodies of ore will be found at various points. The resources of the property are ample enough to sustain several mills, and the important question for consideration is one of efficiency and cheapness rather than supply. The average value of the ore is thought by the assayer of the company to be \$7 per ton for the schists, and not less than \$15 per ton for the heavy and pure sulphurets. The ordinary run of the ore carries apparently about 3 per cent. of iron pyrites, and is somewhat refractory to treat. It is claimed that the present machinery will allow the extraction of \$3 to \$4 per ton. The mill consists of a 10-stamp battery with some minor appliances adapted to a more thorough treatment of the ore. An increased plant is contemplated. This property offers an unrivaled opportunity for extended, steady, and remunerative work. The present machinery is adequate to a production of at least \$1,000 per month, which seems to me not an unreasonable expectation. The administration is energetic, and apparently backed by an adequate capital. The future prosperity of the company seems to me to be well assured.

The Magnolia mine in York County has just commenced operations. I was unable to visit the place. The superintendent reports six veins, with ore in abundance and of good quality. A 10-stamp mill is now erecting. The owner is confident of a good return at once, and of continuous and profitable work. The mine has thus far produced but a few hundred dollars.

At the Dorn mine in Abbeville County nothing of importance is now done; the production has been too small to note. The attorneys of the company write me that negotiations are under way looking toward a renewal of the work. This property was once worked with a large return, and it is claimed that there are still large bodies of ore in the mines.

About Spartanburg, and on the Broad River, some gravel mining has been carried on, but the work has been done at odd times, and in a desultory way, and the amount produced is very small.

The gravel deposits of Polk County, North Carolina, extend into the adjacent counties of South Carolina—Spartanburg and Greenville. In neither is there a large production; the work is very intermittent.

The production of South Carolina for 1880 has been very small, though on the increase.

The total amount deposited at the Charlotte assay-office, which was considerably more than one-half, was \$8,082.58, and may have been in all \$12,000. The yield of 1881 will be much larger; the small and desultory work will not change, but the gravel mines in Spartanburg and at the Brewer property, as well as the Haile and the Magnolia mines, will add largely to the wealth of the county. I anticipate a production of not less than \$40,000.

GEORGIA.

The auriferous area of Georgia covers something more than one-third of the northern part of the State, and stretches from South Carolina on the east to Alabama on the west; it is geologically the extension of the area of North and South Carolina. But only a few points comparatively of this area have produced gold on a working scale. The only parts now extensively worked are in Lumpkin, Dawson, and White Counties, the first named being the most prolific.

The occurrence of the gold is not very dissimilar to that of Western North Carolina.

Schists everywhere make up the country—chloritic, micaceous, talcose, and sometimes, though rarely, hornblendic. They are usually decomposed to a great depth and easily broken up, and when not decomposed they are soft enough to yield to the pick. The country is extremely broken, and might properly be called mountainous; the valleys are usually deep and traversed by bold streams carrying an abundance of water; the hills are so connected by ridges as to allow the easy conveyance of water by cheaply made ditches, and very little fluming is needed.

The gold appears to occur in seams of quartz, which traverse the strata in great numbers, usually parallel to the strata, and varying in thickness from $\frac{1}{4}$ inch to 6 inches, rarely more. There are zones of strata which are particularly abundant in these seams, with a width varying from 10 to 400 feet. The mining is chiefly carried on in these zones, as outside of them the seams are so few as to make the ore of too low grade to be of economic importance. These belts run across the country with the strata in a general northeast and southwest direction; that is, at points long distances apart, and in the general alignment of the strata bodies of ore are found of the same general character.

The auriferous territory of this State was largely obtained from the Indians by treaty some forty-five years ago, and the mineral portion was divided for the most part into lots of 40 acres, with lines running north and south, east and west. This method of division has greatly facilitated work in many respects.

Gold was discovered in Georgia at about the same time as in the Carolinas, viz, in 1828-'31. For twenty years the ravines, and particularly the streams, where nature had concentrated the gold in the course of ages, gave opportunities for the most profitable work. The exhaustion of this readily worked ground led to attempts to work the veins. The richer parts of them allowed profitable work a little while longer, but mining in Georgia was for many years relatively unprosperous.

Before the late war the necessity for larger supplies of water for the treatment of the mineral bodies had become so evident that "ditch" companies were organized for this purpose. The disastrous industrial effect of that struggle was so great that the benefits of these supplies were not properly utilized till quite recently.

During the last five years gold mining has been placed on a firmer basis, for the possession of bodies of ore whose locality, extent, and richness were easily ascertained, together with a sure supply of water, removed the subject to a great extent from the region of probability and made it more of a certainty.

The most efficient methods of treatment have been pretty well settled, varying at different points only as the different circumstances compel a change, and usually only in minor particulars.

The skillful and energetic efforts of a few men prominent in mining matters in this section have determined the conditions of successful work. Apparently the efforts of the future will be directed to the perfecting of the details, so as to secure such an extraction of the precious contents as is consistent with the least cost.

The ore is of very low grade. I could not learn that any effort has been made to ascertain exactly the average value of the ores, but from a comparison of all the information attainable I am inclined to put it at not more than \$1.25 to \$1.50 per ton, although in every mine chimneys may be met at any time which will oftentimes go far higher than this.

The general method of exploiting these mines is as follows: The mine being selected and the position and extent of the ore bodies being approximately determined, the first care is to secure water from some ditch company and to draw it into its own reservoir at such an elevation as will allow it to command every part of the ore body. Now and then this is found impracticable, and the water is pumped from the highest attainable point of flowage up to the desired higher point. At the same time the strata which overlie the body of ore are removed or opened so as to expose the ore and to allow of its ready removal through the cut to the mill, which, in the mean time, is established in some ravine near at hand. In wisely conducted work there should be several of these openings, so that in case of accident to one, or in case of a temporary impoverishment or pinching out, other points will afford the needed supply of ore to the mill.

At the outset the treatment is purely hydraulic. The water is thrown against the ore with the tremendous force due to its fall of 60 to 150 feet or more, and rapidly eats it out of its lead and washes it into the sluices in the bottom of the cut and down into the mill-house. Sometimes a few blows from a sledge-hammer are needed to break up the harder material, but generally by the time the material has reached the mill-house, which may be from 100 to 1,200 yards away, the decomposed and soft slate is well pulverized and much of it floats away, leaving its gold in the sluices, while the harder slate and quartz is carried into the mill, pulverized, and amalgamated.

The mills are of the usual California pattern, modified to suit the ore. They are generally run in double batteries of 10 stamps and operated with stamps of 350 to 400 pounds, making sixty 8-inch drops per minute, and discharging through screens with meshes of $\frac{3}{8}$ to $\frac{1}{2}$ of an inch opening. The softness of the material and the coarseness of the screen allow the treatment of about 3 tons per day per stamp, which corresponds to 5 to 10 tons of material as it stood in the mass. Almost no hauling is given this material, so that twenty-five men, as in the Pigeon Roost mine, will supply the ore and do all the work for a 40-stamp mill. Occasionally a mill is so situated that it can be run by water-power, which materially reduces the cost of operation, though sometimes enhancing the original cost of the plant. But even when the motive power is steam the cost of operation is not excessive, as wood is cheap and labor rarely high. The cost of water is the most serious item, the charge at present being 12 cents per day per inch, of which rarely less than 25 inches are used, and sometimes 100 or more.

In a mine with the average advantages the total cost for the ore passed through the mill will hardly exceed 25 cents per ton, and as 75 cents per ton is not an uncommon yield the margin of profit is good. The accompanying sketch (marked A) shows the situation of each mine now worked, of the rivers, ditches, and also the general alignment of the so-called veins.

The mines at work in Lumpkin County are as follows, viz:

	Stamps.
Chicago and Georgia Gold Mining Company.....	10
Cleveland Gold Mining Company.....	20
Hightown Gold Mining Company.....	20
Pigeon Roost.....	40
S. E. Griscomb.....	10
Lockhart.....	5
Bart.....	10
Findley.....	50
White.....	10
Jones.....	
Fish Trap.....	10
Troy.....	20

The following mines have been suspended for the winter:

	Stamps.
Auroria Gold Mining Company.....	10
Dane.....	10
Dahlongega.....	10
Singleton.....	10

Two new mines are expected to be put to work in the spring, viz:

Bell mine	Stamps.
Proserpine mine	10

A.



- | | |
|------------------------------------|---------------------------------|
| I—Pigeon Roost. | XI—Proserpine. |
| II—White. | XII—Aurora Gold Mining Company. |
| III—Findley. | XIII—Palmour. |
| IV—Singleton. | XIV—S. Griscomb Company. |
| V—Fish Trap. | XV—Ivey. |
| VI—Chicago and Georgia. | XVI—Bart. |
| VII—Cleveland Gold Mining Company. | ▨—Dahlonga Village. |
| VIII—Hightown Gold Mining Company. | □—Mining lots. |
| IX—Danæ. | ---—"Veins." |
| X—Dahlonga. | |

The Pigeon Roost and the Findley are the two great mines of this section, and at both the production has been large. The former in particular is especially well opened, and provided with the best appliances to secure economy and efficiency. It is operated by a turbine, so that the cost of motive is extremely small. It is situated on the Pigeon Roost or Sand Belt, which is regarded generally as the richest of this section. The mine is unusually well opened. The yield in 1879 was \$35,000. The returns for

1880 had not yet been received at my visit, but the superintendent assured me that these figures were fully maintained. The Findley mine is also well opened and provided with ample mining ground to supply its large mills, of which it has two, provided with 50 stamps in all. Its production is but little behind that of Pigeon Roost, but no statement could be furnished. Of the other and smaller companies about one-half are in condition for effective work, notably the Cleveland, the Hightown, the Chicago and Georgia, the Troy, and the Bart. Others have but just commenced work, and nothing certain can be said respecting them. A very few are confessed failures, but there is a less proportion of this class than in other sections.

In Dawson County a few mines are now opening, but the work of production at present is confined to individual miners, who prosecute their work at times of leisure rather than as an exclusive business. A similar statement may be made regarding Hall and White Counties.

The Land mine in the latter county has been the most noted and one of the most prolific, but it is at present, as reported to me, out of work and in litigation.

The Lumsden mine has during the year yielded a large number of large and interesting. Other mines are the Sprague, the Lewis, and the Reynolds.

The production of White County is estimated to be about \$15,000 per year. The production of Dawson County is given by F. W. Hall, esq., of Dahlonega, at \$10,000 per year; as he has unusual facilities for information in such matters, I have taken his figures for my guide.

The tendency in this State has been to form too small companies; a mill of 10 stamps will pay expenses if it is properly planned and economically administered, but it will rarely have much above this for profit, for the cost of operating a 10-stamp mill is much greater proportionately than for one provided with 20 stamps.

The prime necessity here is a large establishment provided with the requisite facilities for the treatment of large bodies of ore.

Mining ground is held at moderate rates, and the necessary machinery can be obtained at very moderate figures. I can give one instance where the entire cost of mine, ditches, water works, buildings, and cost of opening was less than \$17,000.

The future of Georgia mines seems to me to be well assured and modest profits reasonably certain. I think that the production of 1880 will be fully maintained in 1881, if not somewhat increased. The production of Georgia in 1880 has been variously estimated, and I take up the matter with some hesitation. Not one-third of the companies I have alluded to have made full or approximate returns of their production. So far as given it amounts to \$59,880, in Lumpkin County. The yield of the mines not reporting is, from the best information at my command, \$37,000; to this must be added the production of White and Dawson Counties, viz:

Lumpkin County (reported and estimated).....	\$96,880
White County (known).....	10,000
White County (estimated).....	5,000
Dawson County (estimated).....	10,000
	<hr/>
	121,880

The first two enumerated items and the last would naturally seek an outlet in great part at Gainesville, the nearest railroad and express point; the express shipments from this point from July 1 to December 31, 1880, were \$41,775. The express agent thought that one-eighth of the production of Lumpkin and Dawson Counties found its way out by private hands; this would indicate a production for these counties of \$8,000 per month.

I think the above calculation may not be far from correct—rather under than in excess of the entire amount produced.

The gold produced in White County finds an exit at Mount Airy usually.

MAINE.

A number of mines have been opened and mining companies organized in Maine. Circulars addressed have been forwarded, requesting from the officers, agents, and owners of these mines a report of their production, but although replies have been received from several, no report has been made of any of the shipments of the ore or bullion from the State; and as none has been reported, and as the mints and assay offices have reported no deposits from that State of bullion produced yet, Maine cannot be reckoned as one of the gold or silver producing States of the Union. All information thus far received relates to the sinking of shafts and to the assays of ores, which thus far have been promising rather than productive.

GOLD FROM INDIANA.

Deposits of gold in native grains from this State are occasionally made at the United States mint. The Superintendent of the Mint at Philadelphia reports, in relation to a deposit made at the institution in his charge in July, 1880, "that the deposit in question consisted of small particles of very clean and pure gold dust collected by washing the soil in Brown County, Indiana, and was sent to the Mint by W. P. Sparks, Morgantown, Ind." Small deposits from the same part of the State have been previously made at rare intervals.

In further reference to the existence of gold deposits in Indiana, I have to say that while there are no auriferous rocks in the State, the occurrence of gold dust in the drift gravels at various localities has long been known to geologists. I have condensed the following notes from the reports cited below, thinking that the facts would be of interest. The gold in Indiana is found in drift of the glacial epoch at various places on Laughery Creek near Hartford, but the best known localities are in Morgan and Brown Counties. Mining excitements of more or less magnitude have occurred in the latter county within the last forty years. As early as 1837, Dr. David Dale Owen, State geologist, cautioned the public against expending money in mining adventures in pursuit of this gold, which has been brought by ice action from veins north of the great lakes. According to Prof. John Collett (Assistant Geological Survey) there had been collected in Brown County up to 1874 not more than \$10,000 worth of gold dust. Diamonds have also been found in the same drift, as also fragments of native copper. No true mines of these minerals exist within the State. For a more detailed account consult Geological Report of Indiana, 1878, by E. F. Cox, pages 115-116.

Similar occurrences of gold in glacial drift have been observed in several localities in Ohio, and notably in Geauga County (*vide* Newberry, Geological Survey of Ohio, 1870, page 472).

UNITED STATES.

General statistics relating to the production of the mines, the transportation, smelting, refining, coinage, and export of gold and silver in the United States.

ESTIMATE OF PRODUCTION.

The following statement, made by Wells, Fargo & Company's Express, of the production of the precious metals west of the Missouri River for the annual year of 1880 is partly estimated:

WELLS, FARGO & COMPANY,
EXCHANGE, BANKING, AND EXPRESS,
San Francisco, December 31, 1880.

DEAR SIR: The following is a copy of our annual statement of precious metals produced in the States and Territories west of the Missouri River, including British Columbia (and receipts in San Francisco by express from the west coast of Mexico), during 1880, which shows aggregate products as follows: Gold, \$33,522,182; silver, \$40,005,364; lead, \$5,742,390; copper, \$898,000; total gross result \$80,167,936.

California shows an increase in gold of \$579,579, and a decrease in silver of \$360,873. Nevada shows a total falling off of \$6,966,093; the yield from the Comstock being only \$5,312,592, as against \$8,830,562 in 1879—a decrease of \$3,517,970. The product of Eureka district is \$4,639,025, as against \$5,859,261 in 1879—a decrease of \$1,220,236. Utah shows an increase of \$982,074. Colorado shows an increase of \$6,871,474 over our report of last year—chiefly from Leadville district. Dakota shows an increase of \$914,094. Arizona shows a notable increase.

Statement of the amount of precious metals produced in the States and Territories west of the Missouri River, including British Columbia (and receipts in San Francisco by express from the west coast of Mexico), during the year 1880.

States and Territories.	Gold dust and bullion by express.	Gold dust and bullion by other conveyances.	Silver bullion by express.	Oras and base bullion by freight.	Total.
California	\$16, 900, 745	\$845, 000	\$378, 567	\$151, 854	\$18, 276, 166
Nevada	236, 323	-----	11, 071, 992	3, 723, 306	15, 031, 621
Oregon	692, 525	346, 262	20, 854	-----	1, 059, 641
Washington	68, 911	34, 500	1, 753	-----	105, 164
Idaho	1, 175, 115	235, 023	332, 755	151, 854	1, 894, 747
Montana	1, 115, 787	55, 789	919, 189	1, 731, 614	3, 822, 379
Utah	95, 968	10, 336	3, 076, 775	3, 267, 884	6, 450, 953
Colorado	2, 278, 989	-----	1, 706, 000	17, 300, 000	21, 284, 989
New Mexico	27, 300	-----	684, 000	-----	711, 300
Dakota	3, 749, 081	374, 000	-----	-----	4, 123, 081
Arizona	159, 970	80, 000	2, 830, 449	1, 402, 052	4, 472, 477
Mexico (west coast)	118, 248	-----	1, 586, 309	386, 000	2, 090, 557
British Columbia	675, 894	168, 973	-----	-----	844, 867
Total	27, 294, 846	2, 149, 883	22, 608, 643	28, 114, 564	80, 167, 936

The bullion from the Comstock Lode contains 50.42 per cent. gold and 49.58 per cent. silver. Of the so-called base bullion from Nevada, 37.60 per cent. was gold; and of the whole product of the State, 28.70 per cent. was gold.

The gross yield for 1880, shown above, segregated, is, approximately, as follows:

Bullion.	Per cent.	Gross yield.
Gold	41.82	\$33, 522, 182
Silver	49.90	40, 005, 364
Lead	7.16	5, 742, 390
Copper	1.12	898, 000
Total	-----	80, 167, 936

Annual products of lead, silver, and gold in the States and Territories west of the Missouri River, 1870-1880.

Year.	Product as per Wells, Fargo & Co's statements, including amounts from British Columbia and west coast of Mexico.	Product after deducting amounts from British Columbia and west coast of Mexico.	The net product of the States and Territories west of the Missouri River, exclusive of British Columbia and west coast of Mexico, divided, is as follows:			
			Lead.	Copper.	Silver.	Gold.
1870	\$54, 000, 000	\$52, 150, 000	\$1, 080, 000	-----	\$17, 320, 000	\$33, 750, 000
1871	58, 284, 000	55, 784, 000	2, 100, 000	-----	19, 286, 000	34, 398, 000
1872	62, 236, 959	60, 351, 824	2, 250, 000	-----	19, 924, 429	38, 177, 395
1873	72, 258, 693	70, 139, 860	3, 450, 000	-----	27, 483, 302	39, 206, 558
1874	74, 401, 045	71, 965, 610	3, 800, 000	-----	29, 699, 122	38, 466, 488
1875	80, 889, 057	76, 703, 433	5, 100, 000	-----	31, 635, 239	29, 068, 194
1876	90, 875, 173	87, 219, 859	5, 040, 000	-----	39, 292, 924	42, 886, 935
1877	98, 421, 754	95, 811, 582	5, 085, 250	-----	45, 846, 109	44, 880, 223
1878	81, 154, 622	78, 276, 167	3, 452, 000	-----	37, 248, 137	37, 576, 030
1879	75, 349, 501	72, 688, 888	4, 185, 769	-----	37, 032, 857	31, 470, 262
1880	80, 167, 936	77, 232, 512	5, 742, 390	\$898, 000	38, 033, 055	32, 559, 067

The exports of silver during the present year to Japan, China, India, the Straits, &c., have been as follows: From Southampton, \$24,000,000. From Marseilles and Venice, \$6,000,000; San Francisco, \$4,700,000. Total \$34,700,000, as against \$46,000,000 from the same places in 1879.

JNO. J. VALENTINE,
General Superintendent.

The following statements of the business done by the Boston and Colorado, Golden and Moore Smelting Works, of Colorado, during the calendar year 1880 are taken from the Great West and Denver Tribune, and of the Newark Smelting and Refining Works and the Pennsylvania Lead Company, from the Mining Record:

Shipments of gold, silver, and copper from the works of the Boston and Colorado Smelting Company for the year 1880.

Counties.	Gold.	Silver.	Copper.	Total.
Gilpin.....	\$433,000	\$152,000	\$99,000	\$689,000
Clear Creek.....	162,000	496,000	78,000	736,000
Boulder.....	97,000	93,000	2,000	192,000
Park.....		326,000	1,000	327,000
Lake.....		223,000		223,000
Chaffee.....		32,000		32,000
Summit.....		19,000		19,000
Gunnison.....		17,000		17,000
Custer and San Juan.....		27,000	4,000	31,000
Utah and Nevada.....	1,500	7,500	2,000	11,000
Montana.....		151,000	290,000	441,000
Other sources.....	1,000	12,500	4,000	17,500
Totals.....	694,500	1,556,000	480,000	2,730,500
For the year 1879.....				2,449,500
Increase of 1880 over 1879.....				281,000

The increase of 1879 over 1878 was \$190,500; so it will be seen that the business of these works is on the increase.

Statement of the business done by the Golden Smelting Company for the year 1880.

Counties.	Tons.	Ounces gold.	Ounces silver.	Value.
Gilpin.....	2,205	3,602.5	20,242	\$100,693 37
Clear Creek.....	1,425	99.5	164,457	222,939 10
Boulder.....	622.5	3,004.5	42,005	109,990 16
Lake.....	431½		108,018	123,140 52
Summit.....	53½	33½	1,849	4,728 83
Custer.....	275½		10,672	24,552 28
Production for the year.....				586,044 26

Ore purchased by the Moore Mining and Smelting Company's Valley Smelting Works, Golden, Colorado, for the year ending December 31, 1880.

Counties.	Tons.	Ounces gold.	Ounces silver.	Pounds lead.	Value.
Gilpin.....	3,647	5,750	30,176	50,000	\$151,047 12
Clear Creek.....	2,080	116	206,070	799,500	269,168 40
Boulder.....	180	412	20,400		31,088 00
Lake and Park.....	240		30,150	100,500	38,100 00
Other sources.....	156	32	7,325	140,600	15,107 00
Total.....	6,242	6,310	294,121	1,090,600	504,460 52

Statement showing the bullion receipts and products of the Newark Smelting and Refining Works for 1880.

Month.	Pounds of bullion.	Dwts. of gold.	Ounces of silver.	Pounds of lead.
January	3,705,144	30,535.2	572,734.3	3,440,404
February	2,622,164	24,988.2	460,905.1	2,440,912
March	2,160,101	33,111.1	402,109.4	2,009,897
April	2,619,243	41,957.2	419,388.5	2,453,767
May	1,805,543	28,470.7	314,592.6	1,684,698
June	3,157,110	60,736.2	448,896.1	2,942,428
July	4,379,636	51,815.1	520,299.7	4,045,074
August	4,212,121	52,622.7	590,971.3	3,938,954
September	2,550,767	64,284.6	387,173.9	2,360,734
October	2,585,064	18,048.1	330,796.7	2,426,577
November	4,562,673	55,823.8	615,764.3	4,311,391
December	3,359,082	57,798.4	428,428.4	3,045,322
Total	37,718,648	520,191.3	5,492,060.3	35,100,158

State.	Pounds of bullion.	Dwts. of gold.	Ounces of silver.	Pounds of lead.
Colorado	28,522,873	228,801.7	4,689,030.0	26,810,891
California	1,191,326	39,645.3	88,985.1	1,088,321
Nevada	5,177,659	247,083.1	319,172.7	4,712,644
Montana	6,289,962	2,604.5	348,144.0	2,001,124
Utah	536,828	2,056.7	46,828.5	487,178
Total	37,718,648	520,121.3	5,492,060.3	35,100,158

Out of the above total from Colorado, the following was received from Leadville: Pounds bullion, 24,231,456; pennyweights gold, 10,861.00; ounces silver 3,642,014.00; pounds lead, 22,796,146.

THE PENNSYLVANIA COMPANY.—The Leadville branch of the Pennsylvania Lead Company has done a large business in the purchase of Leadville bullion during the past year. The value of the silver shipped, computed at \$1.12½ per ounce, amounts to \$1,371,644. The lead, at 5 cents a pound, which was about the average for the year, amounts to \$582,820, and the gold to \$10,190, or a total valuation of \$1,964,654. The following table shows the bullion shipments by months. In July, the month following the strike, none being sent out:

Month.	Pounds of bullion.	Ounces of silver.	Ounces of gold.
January	607,508	91,935	21.5
February	1,758,501	197,608	41.0
March	1,726,711	165,707	86.8
April	1,968,298	193,401	66.7
May	447,437	60,650	50.5
June	306,760	55,256	.....
July .....	.....	.....	.....
August	908,979	84,024	46.0
September	1,087,989	85,868	26.5
October	1,356,146	90,797	16.5
November	1,472,441	74,943	60.5
December	361,492	19,065	93.5
Total	11,732,641	1,219,209	509.5

Statement showing the amount of bullion, and locality of production, reported by the following reduction works * as having been treated during the fiscal year 1880.

States and Territories.	From July 1, 1879, to December 31, 1879.			From January 1, 1880, to June 30, 1880.			From July 1, 1879, to June 30, 1880.		
	Gold.	Silver.	Total.	Gold.	Silver.	Total.	Gold.	Silver.	Grand total.
California	\$3, 574, 102	\$373, 556	\$3, 947, 748	\$3, 600, 538	\$557, 224	\$4, 157, 762	\$7, 174, 730	\$930, 780	\$8, 105, 510
Nevada	903, 268	1, 990, 219	2, 893, 487	666, 999	1, 965, 955	2, 632, 954	1, 570, 700	3, 956, 174	5, 526, 441
Utah	59, 556	1, 263, 393	1, 322, 949	13, 953	430, 648	513, 601	73, 509	1, 763, 041	1, 836, 550
Arizona	55, 953	393, 070	449, 023	36, 401	287, 158	323, 559	92, 354	680, 298	772, 852
New Mexico .....	.....	6, 250	6, 250	.....	6, 250	6, 250	.....	12, 500	12, 500
Colorado	657, 476	8, 431, 743	9, 089, 219	632, 017	8, 315, 913	8, 947, 930	1, 289, 493	16, 747, 656	18, 037, 149
Dakota .....	.....	8, 879	8, 879	.....	.....	.....	1, 373	3, 879	5, 252
Wyoming .....	.....	.....	4, 413	.....	.....	.....	413	.....	413
Idaho	77, 852	13, 742	91, 594	77, 852	13, 742	91, 594	155, 704	27, 484	183, 198
Montana	29, 873	739, 273	769, 146	101, 562	544, 666	646, 228	131, 435	1, 283, 939	1, 415, 374
Oregon	19, 315	.....	19, 315	16, 417	2, 902	19, 319	35, 732	2, 902	38, 634
Aggregate	5, 378, 564	13, 215, 125	18, 593, 689	5, 146, 446	12, 193, 458	17, 339, 904	10, 525, 010	25, 408, 583	35, 933, 593

* Boston & Colorado Smelting Works; Ed. Balback & Son; Saint Louis Smelting & Refining Works; Omaha Smelting & Refining Works; Pennsylvania Lead Company; Selby Smelting Works; F. Berton & Co.; George W. Platt & Co.; other small smelting works.

Statement showing the amount of bullion, and locality of production, handled by bankers during fiscal year 1880, as reported to the Director of the Mint.

States and Territories.	From July 1, 1879, to December 31, 1879.			From January 1, 1880, to June 30, 1880.			From July 1, 1879, to June 30, 1880.		
	Gold.	Silver.	Total.	Gold.	Silver.	Total.	Gold.	Silver.	Grand total.
California.....		\$82,579	\$82,979		\$64,192	\$64,192		\$147,171	\$147,171
Nevada.....		3,129,058	3,477,047		3,407,106	3,607,261		6,596,164	7,084,308
Utah.....	69,672	1,420,389	1,490,061	33,010	1,354,025	1,387,035	102,682	2,774,414	2,877,096
Arizona.....	24,514	433,729	458,243	19,470	598,961	618,431	43,984	1,002,690	1,046,674
New Mexico.....	19,498	200,511	220,009	10,230	205,914	216,144	29,728	406,425	436,153
Colorado.....	102,431	7,318,950	7,421,381	53,291	7,497,221	7,550,512	155,722	15,236,171	15,411,893
Dakota.....	428,757	8,120	436,877	263,467	11,207	274,674	692,224	19,357	711,531
Wyoming.....	351		351				351		351
Idaho.....	9,818	41,254	51,072		31,394	31,394	9,818	62,880	72,698
Montana.....	448,258	472,692	920,950	170,042	402,269	572,311	618,310	874,361	1,492,671
Aggregate.....	1,451,288	13,097,264	14,548,552	689,665	14,042,289	14,731,954	2,140,933	27,139,553	29,280,506

Statement showing the amount of bullion, and locality of production, reported as transported by the Central Pacific, Virginia and Truckee, and Atclison, Topelca and Santa Fé Railroads during the fiscal year 1880.

States and Territories.	July 1, 1879, to Dec. 31, 1879.		Jan. 1, 1880, to June 30, 1880.		July 1, 1879, to June 30, 1880.	
	Gold and silver.	Tons.	Gold and silver.	Tons.	Gold and silver.	Tons.
California.....		913		4,702		5,615
Nevada.....		29,177		38,609		67,786
Utah.....		961		246		1,207
Arizona.....		629		.....		.....
Colorado.....		5,301		10,570		15,871
Aggregate.....		36,981		54,127		91,108

Statement showing the amount of bullion, and locality of production, reported as shipped by the Pacific, Wells-Fargo, Southern and Sidney, and Black Hills Express Companies during fiscal year 1880.

States and Territories.	From July 1, 1879, to December 31, 1879.			From January 1, 1880, to June 30, 1880.			From July 1, 1879, to June 30, 1880.		
	Gold.	Silver.	Total.	Gold.	Silver.	Total.	Gold.	Silver.	Grand total.
California.....	\$7,783,609	\$197,592	\$7,981,201	\$7,783,609	\$197,592	\$7,981,201	\$15,567,218	\$395,184	\$15,962,402
Nevada.....	84,290	7,085,227	7,169,517	84,290	7,085,227	7,169,517	168,580	14,170,454	14,339,034
Utah.....	142,250	1,150,166	1,292,416	73,253	1,041,511	1,114,764	215,503	2,191,677	2,407,180
Arizona.....	109,649	779,874	889,523	109,649	779,874	889,523	219,298	1,559,748	1,779,046
Colorado.....	1,254,206	984,886	2,239,092	1,187,299	1,093,811	2,280,610	2,441,505	2,078,197	4,519,702
Dakota.....	620,000	.....	620,000	1,655,000	.....	1,655,000	2,285,000	.....	2,285,000
Idaho.....	474,432	267,235	741,667	474,432	267,235	741,667	948,864	534,470	1,483,334
Montana.....	502,785	709,963	1,212,698	342,236	139,797	482,033	844,971	849,760	1,694,731
Oregon.....	437,594	2,650	460,244	457,594	2,650	460,244	915,188	5,800	1,920,488
Washington.....	37,679	902	38,581	87,679	902	88,581	75,358	1,804	77,162
North and South Carolina and Georgia.....	2,018	.....	2,018	28,666	.....	28,666	30,684	.....	30,684
Aggregate.....	11,478,462	11,178,495	22,656,957	12,233,707	10,608,069	22,841,806	23,712,109	21,786,594	45,498,703

SAN FRANCISCO TREASURE SHIPMENTS.

The Alta California has the following table showing the description and destination of all treasure shipments from San Francisco during 1880:

Destination.	Gold bars.	Silver bars.	Silver coin.	Gold dust.	Gold coin.	Trade dollars.	Mexican dollars.	Totals.
New York	\$9,000	\$594,850	\$116,750	.....	\$4,846,507	.....	.....	\$6,344,650
Hong-Kong	1,041,279	.....	\$35,225	330,899	\$1,000	\$2,104,232	3,512,680
Japan	1,235,000	.....	.....	.....	.....	155,000	1,390,000
England	177,415	.....	.....	.....	.....	.....	177,415
Germany	311,898	.....	.....	.....	.....	.....	311,898
Honolulu	112,651	.....	87,720	.....	341,800	542,670
Central America	203,108	11,900	.....	11,600	.....	27,700	447,450
Panama	10,000	.....	.....	.....	.....	.....	10,000
China	115,000	.....	.....	.....	.....	50,000	165,000
British Columbia	500	.....	214,500	.....	.....	215,000
Total	9,000	3,688,550	241,801	35,225	5,491,226	1,000	2,678,782	12,923,727

The foregoing does not include shipments made through the mails.

The following shows the shipments of silver in 1880 from San Francisco to Hong-Kong and China:

Months.	Refined.	Mexican dollars.	Trade dollars.
January	\$338,000	\$71,014	.....
February	156,660	295,677	\$1,000
March .....	.....	63,231	.....
April	24,820	110,300	.....
May	256,799	480,693	.....
June .....	.....	102,819	.....
July .....	.....	139,404	.....
August .....	.....	53,540	.....
September .....	.....	158,110	.....
October	110,000	213,874	.....
November .....	.....	277,732	.....
December .....	.....	187,788	.....
Totals	1,156,279	2,154,182	1,000

The total for 1880 is \$3,311,461, against \$8,800,732 in 1879, showing a comparative decrease of \$5,489,271 for the past year.

STATEMENT OF THE AMOUNT OF GOLD AND SILVER BULLION AND ORE SHIPPED, AND PLACES OF SHIPMENT, BY THE CENTRAL PACIFIC RAILROAD COMPANY DURING THE FISCAL YEAR 1880.

FROM THE STATE OF CALIFORNIA.

Shipment of bullion and ore, via the Central Pacific Railroad, during the fiscal year 1880 (from July 1, 1879, to June 30, 1880).

Counties from which shipped.	Destination.	Ore.	Bullion or crude metal.	Copper ore.	Copper cement.
		<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Amador	West	21,780	.....	137,110	126,020
Calaveras	do	79,550	.....	408,330	3,890
Fresno	do	1,720	.....	.....	.....
Kern	do	56,060	1,053,750	.....	.....
Los Angeles	do	20,440	.....	.....	.....
Larimer	do	220	.....	57,070	267,290
Merced	do	24,530	.....	.....	.....
Nevada	do	120	920	.....	.....

Shipment of bullion and ore via Central Pacific Railroad, &c.—Continued.

Countries from which shipped.	Destination.	Ore.	Bullion or crude metal.	Copper ore.	Copper cement.
		<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Placer.....	West.....	748,920		2,680	
Sacramento.....	do.....	1,811	20,000		
Santa Barbara.....	do.....	10,740			
San Bernardino.....	do.....	41,500			
San Diego.....	do.....	7,550			
San Francisco.....	do.....	21,900		215,760	12,340
San Joaquin.....	do.....	3,990			
Shasta.....	do.....	11,740			
Stanislaus.....	do.....	42,850			
Tehama.....	do.....	160			
Tulare.....	do.....	6,920			
Yuba.....	do.....	6,700		6,710	
Ogilby,* unknown counties.....	do.....	7,320,000			
Total.....		8,429,201	1,074,670	827,660	409,540

*Probably Arizona ore.

FROM THE STATE OF NEVADA.

Shipment of bullion and ore, via the Central Pacific Railroad, during the fiscal year 1880.

Countries from which shipped.	Destination.	Ore.	Bullion or crude metal.	Copper ore.	Copper cement.
		<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Churchill.....	West.....	160			
Elko.....	do.....	2,210		95,090	560
Do.....	East.....	105,200		42,600	85,200
Eureka.....	do.....	170	2,422,170		
Do.....	West.....	3,460	2,539,560		5,940,000
Do.....	do.....	3,760,180	10,214,140		
Do.....	East.....	141,600			
Humboldt.....	do.....	144,850			
Do.....	West.....	278,600	40,000		
Lander.....	do.....	853,010		180	
Do.....	East.....	360,440			
Ormsby.....	West.....	3,570			
Storey.....	do.....	2,200			
Washoe.....	East.....	1,170			
Do.....	West.....	113,600		160	
Total.....		5,809,470	15,215,890	138,030	6,025,760

FROM THE TERRITORY OF ARIZONA.

Shipment of bullion and ore, via the Central Pacific Railroad, during the fiscal year 1880.

Countries from which shipped.	Destination.	Ore.	Bullion or crude metal.	Copper ore.	Copper cement.
		<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Maricopa.....	West.....	90			
Mohave.....	do.....	9,200			
Pima.....	do.....	132,070	69,780	41,250	
Pinal.....	do.....	478,580	152,420	20,250	
Yuma.....	do.....	1,121,190			
Unknown counties.....		34,930			
Total.....		1,776,060	222,200	61,500	

FROM THE TERRITORY OF UTAH.

Shipment of bullion and ore, via the Central Pacific Railroad, during the fiscal year 1880.

Counties from which shipped.	Destination.	Ore.	Bullion or crude metal.	Copper ore.	Copper cement.
		<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
Box Elder.....	West	670	.....	.....	.....
Do	East	2,200	.....	.....	.....
Weber	West	3,520	315,450	.....	130,070
Total.....	.....	6,390	315,450	.....	130,070

Recapitulation of bullion and ore shipped, via the Central Pacific Railroad, during the fiscal year 1880, from the following States and Territories.

State.	DESTINATION.								Total.
	West.				East.				
	Ore.	Bullion or crude metal.	Copper ore.	Copper cement.	Ore.	Bullion or crude metal.	Copper ore.	Copper cement.	
	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>	<i>Pounds.</i>
California	8,429,201	1,074,670	827,660	409,540	.....	.....	.....	.....	10,741,071
Arizona	1,776,060	222,200	61,500	.....	.....	.....	.....	.....	2,059,760
Nevada	5,055,990	12,793,720	95,430	5,940,560	753,480	2,422,170	42,600	85,200	27,189,150
Utah	4,190	315,450	.....	130,070	2,200	.....	.....	.....	451,910
Total....	15,265,441	14,406,040	984,590	6,480,170	755,680	2,422,170	42,600	85,200	40,441,891

* Includes 7,320,000 pounds shipped from Ogilby, probably Arizona ore.

Statement showing the places of production of the refined and non-refined domestic silver sold the Treasury Department, in lots exceeding 10,000 ounces, by the bankers of San Francisco during the fiscal year 1880.

States or Territories.	Fine silver.	Other silver.	Total.
Arizona	\$5,974	\$567,735	\$573,709
California	7,835	115,284	123,119
Idaho .....	.....	19,083	19,083
Montana .....	.....	3,297	3,297
Nevada .....	.....	2,563,373	5,028,986
Oregon .....	.....	975	975
Utah .....	.....	8,140	8,140
Unknown	736,478	749,447	1,485,925
Aggregate.....	3,213,900	4,029,334	7,243,234

Statement of gold and silver bullion on hand at the mints and New York assay-office, and showing gain and loss from June 30, 1880, to December 31, 1880.

GOLD BULLION.

Mints.	On hand June 30, 1880.	On hand December 31, 1880.	Gain.	Loss.
Philadelphia.....	\$9,887,445 94	\$24,360,796 51	\$14,473,350 57	.....
San Francisco.....	2,042,470 73	1,477,360 85	.....	\$565,109 88
Carson.....	185,269 98	105,092 51	.....	80,092 51
New Orleans.....	27,723 17	57,329 29	29,606 12	.....
New York.....	28,581,428 09	61,491,294 62	35,909,866 53	.....
	19,724,197 91	50,491,813 78	50,412,763 22	645,202 39
Gold bullion net gain .....	.....	.....	49,767,560 83	.....

Statement of gold and silver bullion on hand at the mints, &c.—Continued.

SILVER BULLION.

Philadelphia.....	\$3,304,258 80	\$2,655,584 92	.....	\$648,673 88
San Francisco.....	969,108 25	2,553,016 35	\$1,583,908 10	.....
Carson.....	276,381 93	203,054 54	.....	73,327 39
New Orleans.....	619,997, 67	746,187 52	126,189 85	.....
New York.....	1,113,866 47	1,079,820 59	.....	34,045 88
	6,283,613 12	7,237,663, 92	1,710,097 95	756,047 15
Silver bullion net gain.....			954,050 80	.....

Statement of gold and silver bullion on hand at the mints and New York assay-office, and showing gain and loss from January 1, 1880, to December 31, 1880.

GOLD BULLION.

Mints.	On hand Jan- uary 1, 1880.	On hand De- cember 31, 1880.	Increase.	Decrease.
Philadelphia.....	\$10,263,028 53	\$24,360,796 51	\$14,097,767 98	.....
San Francisco.....	1,702,478 10	1,477,360 85	.....	\$225,117 25
Carson.....	132,330 13	105,092 51	.....	27,337 62
New Orleans.....	63,199 65	57,329 29	.....	5,870 36
New York.....	49,573,281 88	64,491,234 62	14,917,952 74	.....
	61,734,318 29	90,491,813 78	29,015,720 72	258,325 23
Gold bullion net increase.....			28,757,395 49	.....

SILVER BULLION.

Philadelphia.....	\$3,403,967 66	\$2,655,584 92	.....	\$748,382 74
San Francisco.....	639,558 34	2,553,016 35	\$1,913,458 01	.....
Carson.....	170,609 05	203,054 54	32,445 49	.....
New Orleans.....	593,546 52	746,187 52	152,641 00	.....
New York.....	1,349,922 23	1,079,820 59	.....	270,101 64
	6,157,603 80	7,237,663 92	2,098,544 50	1,018,484 38
Silver bullion net increase.....			1,080,060 12	.....

THE PRODUCTION OF THE PRECIOUS METALS IN THE UNITED STATES.

[From the report of the Director of the Mint for 1879.]

As will be seen, the production of 1879 is considerably less than that of the preceding year. It has resulted from the diminished yield of the mines of the Comstock Lode. A depth has been reached 1,000 feet below the bed of the Carson River, and impediments are encountered from accumulations of water and from the oppressive temperature, which discourage and have retarded vertical exploration. This has caused a falling off in the total yield of the State, from the production of the preceding year, which, as officially reported in 1878, was \$47,076,863 of both gold and silver, but which for 1879, J. F. Hollock, the State controller, reports to be only \$19,305,473.97.

After careful inquiry and consideration of the yield of different localities and mines in the United States, I have estimated the total production of the precious metals in the country for the fiscal year 1879 at \$79,712,000, of which \$38,900,000 was gold and \$40,812,000 silver. As

nearly as can be ascertained from official reports and other reliable sources, the production was derived from the mines of the States and Territories as follows:

State or Territory.	Gold.	Silver.	Total.
California.....	\$17,600,000	\$2,400,000	\$20,000,000
Nevada.....	9,000,000	12,560,000	21,560,000
Colorado.....	3,225,000	11,700,000	14,925,000
Montana.....	2,500,000	2,225,000	4,725,000
Idaho.....	1,200,000	650,000	1,850,000
Utah.....	575,000	6,250,000	6,825,000
Arizona.....	800,000	3,550,000	4,350,000
New Mexico.....	125,000	600,000	725,000
Oregon.....	1,150,000	20,000	1,170,000
Washington.....	75,000	20,000	95,000
Dakota.....	2,420,000	10,000	2,430,000
Michigan (Lake Superior).....	-----	780,000	780,000
North Carolina.....	90,000	-----	90,000
Georgia.....	90,000	-----	90,000
Other sources.....	50,000	47,000	97,000
Total.....	38,900,000	40,812,000	79,712,000

In the report of the Director of the Mint for 1874 a table was published which had been prepared by R. W. Raymond, United States Commissioner of Mining Statistics, showing the production of gold and silver in this country from 1848 to 1873. I am unable at present to review the data from which this table was prepared or to vouch for its accuracy, but it seems to be desirable that these estimates should be brought up to date.

The following is an approximate estimate of the domestic production for the last six years. It is condensed from a table appended to this report, and embraces the entire product of each year, unless a larger amount has been used in the arts or bullion has been clandestinely exported, of which there is no proof or reasonable suspicion:

Domestic production of gold and silver, 1874 to 1879.

Fiscal year ending June 30—	Gold.	Silver.	Total.
1874.....	\$33,490,902	\$37,324,594	\$70,815,496
1875.....	33,467,856	31,727,560	65,195,416
1876.....	39,929,166	38,783,016	78,712,182
1877.....	46,897,390	39,793,573	86,690,963
1878.....	51,206,360	45,281,385	96,487,745
1879.....	38,899,858	40,812,132	79,711,990
	243,891,532	233,722,260	477,613,792

These amounts were ascertained by adding to the amount of domestic bullion purchased or deposited for coinage during the year the amount of domestic bullion exported, consumed in the arts and manufactures, and stock of bullion remaining in the country.

The value of the gold and silver contained in argentiferous ores exported in the last six years has not been included in this estimate. Their total gross value for the whole period was little more than a million dollars, and it is impossible to ascertain how much of this valuation was gold, silver, lead, or copper; and shipments have gradually decreased until, during the fiscal year ended June 30, 1879, they amounted only to \$148,195. The statistics of the production of Germany, France, and England include these ores in the reports of the value of gold and silver produced in those countries from Spanish and American ores.

Domestic production of gold and silver.

GOLD.

Years.	Total coinage.	Deduct coinage of stock on hand, foreign coin and bullion, jew- elers' bars, and United States coin.	Coinage of domestic production.	Add domestic production used in the arts and manufactures. (Reported by New York as- say-office.)	Add estimate of additional do- mestic production other than New York assay-office bars.	Add domestic production ex- ported. (Reported by Bureau of Statistics.)	Total domestic production.
1874	\$50,442,690	\$25,408,659	\$25,034,031	\$3,433,746	\$1,144,582	\$3,678,543	\$83,490,902
1875	33,553,965	7,701,982	25,851,983	4,088,574	1,345,524	2,233,775	33,467,856
1876	38,178,962	4,291,876	33,887,086	3,114,888	1,038,296	1,888,896	39,929,166
1877	44,078,199	1,952,537	42,125,662	2,765,394	921,798	1,084,536	46,897,390
1878	52,798,980	6,876,640	45,922,340	3,809,026	1,269,675	205,319	51,206,360
1879	40,986,912	5,980,953	35,005,959	2,901,844	967,281	24,774	38,899,858

SILVER.

1874	5,983,601	219,063	5,764,538	3,304,920	1,101,640	27,153,496	37,324,594
1875	10,070,368	*221,437	10,291,805	3,178,381	1,059,460	17,197,914	31,727,560
1876	19,126,502	*604,152	19,730,654	2,859,014	953,004	15,240,344	38,783,016
1877	28,549,935	4,005,996	24,543,939	2,830,680	943,560	11,475,394	39,793,573
1878	28,290,825	3,254,637	25,036,188	3,907,614	1,302,538	15,035,045	45,281,385
1879	27,227,882	4,276,114	22,951,768	4,482,975	1,494,325	11,883,064	40,812,132

*During these years the deposits of domestic silver remaining uncoined exceeded the deposits of foreign bullion, &c., and the balance is added instead of deducted.

Deposits and purchases of gold and silver bullion during the fiscal year ended June 30, 1879.

Description.	Mints.					Assay offices.				Total.
	Philadelphia.	San Francisco.	Carson.	Denver.	New Orleans.	New York.	Boise.	Helena.	Charlotte.	
GOLD.										
Redeposits { Fine bars.....	\$8,754,734 26									\$8,806,018 55
United States bullion (domestic production) { Unparted bars.....	272,696 68	\$20,904 60				\$51,284 59		\$133 04	\$4,428 70	711,796 40
United States bullion (domestic production) { Parted bars.....	188,091 69	28,907,727 03	\$318,735 52	\$410,889 83		8,203,577 92	\$67,266 17	404,762 27	48,655 96	28,549,705 89
Foreign bullion.....	71,525 37	357,011 48			\$204 83	126,457 80		575 85		198,083 17
Foreign coin.....	31,698 14	154,712 83	117 19		51,788 33	680,306 59				1,069,796 89
Jewelers' bars, old plate, &c.....	2,147 26				15,420 51	1,200,054 00				1,408,819 71
Jewelers' bars, old plate, &c.....	341,188 82					580,278 64			853 17	937,751 14
Total gold.....	9,662,082 22	29,440,456 04	318,862 71	410,889 33	67,413 67	11,345,562 98	67,266 17	405,471 16	53,947 83	51,771,942 11
SILVER.										
Redeposits { Fine bars.....	3,868,258 12									3,868,258 12
United States bullion (domestic production) { Unparted bars.....	5,457,142 56	13,061,977 50	1,020,660 13	6,120 46	824,944 41	6,234,635 04	4,218 19	324,697 03	333 24	26,934,728 56
United States bullion (domestic production) { Parted bars.....	10,257 45	350 34			4,891 46	261,325 67		4 32		10,607 79
Foreign bullion.....	268,330 13	806,697 84			286,076 10	123,823 02				1,072,919 29
Foreign coin.....	74,105 97	20,403 13	11		12,282 09	122,192 45			29 21	698,632 49
Jewelers' bars, old plate, &c.....										208,609 72
Total silver.....	9,678,094 23	13,889,428 81	1,020,660 24	6,120 46	1,128,194 06	7,010,698 35	4,218 19	324,707 17	397 21	33,071,518 72
Gold and silver received and operated upon.....	19,340,176 45	43,329,884 85	1,339,512 95	417,009 79	1,195,607 73	18,365,261 33	71,484 36	730,178 33	54,345 04	84,843,460 83
Less redeposits:										
Gold.....	9,027,430 84	20,904 60				464,888 03		133 04	4,428 70	9,517,785 31
Silver.....	3,868,258 12					277,722 17		5 82	34 76	4,146,020 87
Total redeposits.....	12,895,689 06	20,904 60				742,610 20		138 86	4,463 46	13,663,806 18
Total deposits and purchases.....	6,444,487 39	43,308,980 25	1,339,512 95	417,009 79	1,195,607 73	17,622,651 13	71,484 36	730,039 47	49,881 58	71,179,654 65

PRECIOUS METALS IN THE UNITED STATES.

195

Locality.	Mints.					Assay offices.			Total.
	Philadelphia.	San Francisco.	Carson.	Denver.	New Orleans.	New York.	Boise.	Helena.	Charlotte.
Alabama.....	\$1,886 85								\$1,886 85
Alaska.....		\$1,108 68							1,168 68
Arizona.....		161,358 94				\$881 47			162,190 41
California.....	372 17	7,949 154 55	\$91,919 28			392,015 24			8,433,461 24
Colorado.....	6,781 16	238 80		\$399,268 83		1,826,141 82			2,232,430 11
Dakota.....	43,821 84		3,121 10	4,959 71		2,144,352 87			2,195,255 22
Georgia.....	30,324 24					47,292 11			80,400 04
Idaho.....	744 09	455,993 15	938 68			289,065 84	\$64,687 80		811,429 86
Lake Superior.....						123 99			1,123 99
Montana.....	2,817 72	31,148 81				1,437,361 79			1,876,690 59
Nevada.....	2 70	36,045 95	223,756 16			1,545,666 25		\$404,762 27	1,806,471 06
New Hampshire.....									89,762 85
New Mexico.....	163 14			5,485 64		84,114 07			82,076 69
North Carolina.....	28,547 36					10,838 22	2,578 37		575,037 81
Oregon.....	4,028 76	568,438 18							5,433 86
South Carolina.....	2,252 14					202 85			1,701 96
Tennessee.....	1,499 61					23,694 80			60,619 47
Utah.....		36,924 67							180 88
Vermont.....	180 86					1,596 77			14,627 54
Virginia.....	13,630 77								21,378 42
Washington Territory.....		21,378 42				14,508 29			27,255 85
Wyoming Territory.....	10,131 96	1,440 45		1,175 15					18,644,428 42
Refined bullion.....		18,644,428 42				380,959 17			1,334,539 46
Parted from silver.....	13,564 28	1,000,016 01				4,092 12			32,034 16
Other sources.....	27,942 04								
Total gold.....	188,091 69	28,997,727 03	318,735 52	410,889 33		8,203,577 92	67,266 17	404,762 27	38,549,705 89

Deposits and purchases of gold and silver bullion during the fiscal year ended June 30, 1880.

Description.	Mints.					Assay offices.				Total.
	Philadelphia.	San Francisco.	Carson.	Denver.	New Orleans.	New York.	Boise.	Helena.	Charlotte.	
GOLD.										
Redeposits { Fine bars	\$35,027,097 76						\$25,812 92			\$35,052,910 69
United States bullion (domestic production)	906,501 41	\$116,111 22					55,669 02	\$6,996 36	\$3,178 13	1,088,456 14
United States coin	125,584 80	27,546,640 57	\$368,174 51	\$344,909 86	\$2,350 43	6,737,404 27	\$147,019 16	466,431 79	82,590 01	35,891,705 40
Foreign bullion	76,332 74	55 00			5,371 63	137,327 04		40 00	202 41	209,338 82
Foreign coin	38,109 31	264,785 86			2,062 74	20,895,974 51		64 81		21,200,997 23
Jewelers' bars, old plate, &c.	75,871 19	599,739 45			62,338 96	39,688,420 62			189 41	40,426,539 63
	388,154 18	18,212 36			25,496 64	743,019 35			1,623 24	1,176,505 77
Total gold	36,637,651 39	28,545,544 46	368,174 51	344,909 86	97,620 40	68,273,627 74	147,619 16	473,532 96	87,783 20	134,976,463 68
SILVER.										
Redeposits { Fine bars	408,568 28						17,189 98			2,518,171 73
United States bullion (domestic production)	44 56						55,576 97	437 26	4 83	56,063 62
United States coin	15,597,682 96	9,967,566 59	622,291 88	4,443 77	1,942,936 12	3,934,708 56	2,052 83	60,630 49	443 75	32,132,756 95
Foreign bullion	36,508 72	6 00			1,783 09	988 11			12 36	39,298 28
Foreign coin	547,082 67	861,488 68			12,370 21	280,500 20		48		1,154,359 57
Jewelers' bars, old plate, &c.	81,712 02	13,222 21			431,190 20	73,245 68			5 50	1,064,746 26
		107 10			21,582 15	145,857 70			102 76	249,361 73
Total silver	16,671,599 21	10,842,390 58	622,291 88	4,443 77	4,502,275 24	4,508,067 20	2,052 83	61,068 23	569 20	37,214,758 14
Gold and silver received and operated upon	53,309,250 00	39,387,935 04	990,466 39	349,353 63	4,599,895 64	72,781,694 94	149,671 99	584,601 19	88,352 40	172,191,221 82
Less redeposits:										
Gold	35,933,599 17	116,111 22				81,481 95		6,996 36	3,178 13	36,141,366 83
Silver	408,612 84				2,092,413 47	72,766 95		437 26	4 83	2,574,235 35
Total redeposits	36,342,212 01	116,111 22			2,092,413 47	154,248 90		7,433 62	3,182 96	38,715,602 18
Total deposits and purchases	16,967,038 59	39,271,823 82	990,466 39	349,353 63	2,507,482 17	72,627,446 04	149,671 99	527,167 57	85,169 44	133,475,619 64

Deposits of gold of domestic production during the fiscal year ended June 30, 1880.

Locality.	Mints.				Assay offices.				Total.
	Philadelphia.	San Francisco.	Carson.	Denver.	New Orleans.	New York.	Boise.	Helena.	Charlotte.
Alabama.....	\$665 94					\$86 85			
Alaska.....		\$5,950 90							\$752 79
Arizona.....	4,070 85	152,967 26	\$367 91			1,513 73			5,950 90
California.....	8,752 54	7,033,656 05	25,369 85			48,667 55			158,919 75
Colorado.....	1,420 39	338 72		\$344,756 91	\$2,350 43	1,897,553 72			7,118,816 42
Dakota.....	971 58	64,330 06				2,684,700 45			2,244,069 74
Georgia.....	28,923 24					44,733 69			2,750,022 09
Idaho.....	4,565 31	365,570 55				20,919 24	\$116,309 37	\$1,807 62	89,831 08
Montana.....	656 41	16,441 84	1,374 64			1,324,982 19		463,687 56	510,546 73
Nevada.....		38,119 81	340,897 45			139,304 59			1,805,768 00
New Mexico.....	607 82					90,459 46			518,261 85
North Carolina.....	14,150 73					14,543 55	31,084 93		91,037 28
Oregon.....		552,280 41							85,659 57
South Carolina.....	2,403 26					90 35			583,365 34
Tennessee.....	1,907 95					13,128 01			11,861 70
Utah.....	401 22	13,295 30	204 66			1,470 83			27,029 19
Virginia.....	7,851 24								9,322 07
Washington Territory.....		34,539 24							34,539 24
Wyoming.....	11,174 63			152 95		5,664 28			17,320 70
Refined bullion.....		18,161,943 52							18,161,943 52
Parted from silver.....	24,041 43	1,106,888 07				318,615 04			1,449,524 54
Contained in silver.....							224 86	936 61	1,161 47
Other sources.....	12,921 26					131,000 74			144,013 13
Total.....	125,584 80	27,546,640 57	368,174 51	344,909 86	2,350 43	6,737,404 27	147,619 16	406,431 79	35,821,705 40

Deposits and purchases of gold and silver bullion at the United States mints during the calendar year 1880.

	Six months, January to June.	Six months, July to December.	Calendar year.
GOLD.			
Redeposits:			
Fine bars	\$20,860,192 05	\$25,580,120 06	\$46,440,312 11
Unparted mint bars	194,775 51	616,182 48	810,957 99
U. S. bullion—gold of domestic production	15,117,188 48	20,255,266 37	35,372,454 85
U. S. coin	112,094 33	258,003 91	370,098 24
Foreign bullion	833,662 32	19,698,313 66	20,531,975 98
Foreign coin	1,037,266 74	41,652,522 39	42,709,789 13
Jewelers' bars	658,782 31	635,652 69	1,294,435 00
Total gold	38,833,911 74	108,696,061 56	147,529,973 30
SILVER.			
Redeposits:			
Fine bars	408,409 65	473,692 28	882,101 98
Unparted mint bars	20,203 40	186,104 65	206,308 05
U. S. bullion—silver of domestic production	15,642,997 58	17,176,219 40	32,819,216 98
U. S. coin	3,691 87	3,307 87	6,999 74
Foreign bullion	746,764 09	596,539 16	1,343,303 25
Foreign coin	305,142 98	365,999 18	671,142 16
Jewelers' bars	126,433 45	130,729 81	263,163 26
Total silver	17,253,643 02	18,938,592 35	36,192,235 37
Total amount received and operated upon ..	56,087,554 76	127,634,653 91	183,722,208 67
Less redeposits:			
Gold	21,054,967 56	26,196,302 54	47,251,270 10
Silver	428,613 05	659,796 93	1,088,409 98
Total re-deposits	21,483,580 61	26,856,099 47	48,339,680 08
Total deposits	34,603,974 15	100,778,554 44	135,382,528 59

Gold of domestic production deposited at the United States mints during the calendar year 1880.

Locality.	Six months, January to June.	Six months, July to December.	Total.
Alabama	\$377 62	\$318 34	\$695 96
Alaska		917 81	917 81
Arizona	87,293 61	107,136 63	194,430 24
California	2,826,582 12	4,149,501 92	6,976,084 04
Colorado	1,012,205 75	1,067,110 79	2,079,316 54
Dakota	1,306,358 11	1,889,830 51	3,196,188 62
Georgia	41,029 85	64,035 85	105,065 70
Idaho	89,863 91	391,881 82	481,745 73
Indiana		40 13	40 13
Maryland		190 94	190 94
Montana	390,847 61	1,132,717 03	1,523,564 64
Nevada	182,338 13	265,289 00	447,627 13
New Mexico	39,085 12	42,994 78	82,079 90
North Carolina	42,571 61	34,833 69	77,405 30
Oregon	186,508 25	529,621 86	716,130 11
South Carolina	5,403 98	4,667 16	10,071 14
Tennessee	382 77	887 57	1,270 34
Utah	4,789 28	15,332 15	20,121 43
Virginia	3,144 44	7,927 01	11,071 45
Washington	6,317 51	17,671 07	23,998 58
Wyoming	3,158 03	6,008 95	9,166 98
Refined gold	8,225,423 86	8,357,406 66	16,582,830 52
Parted from silver	615,701 77	2,106,337 56	2,722,039 33
Other sources	47,805 15	62,607 14	110,412 29
Total	15,117,188 48	20,255,266 37	35,372,454 85

Silver of domestic production deposited at the United States mints during the calendar year 1880.

Locality.	Six months, Jan- uary to June.	Six months, July to December.	Total.
Arizona	\$518,056 89	\$1,297,843 08	\$1,815,899 47
California	163,994 06	526,588 39	690,580 45
Colorado	752,924 84	498,204 57	1,251,129 41
Dakota	21,104 54	108 29	21,212 83
Georgia	29 21	48 70	77 91
Idaho	26,781 54	25,537 44	52,318 98
Lake Superior	20,444 39	39,927 87	60,372 26
Montana	649,772 93	679,500 17	1,329,273 10
Nevada	2,239,684 43	3,117,591 82	5,357,276 25
New Mexico	176,299 63	146,656 17	322,955 80
North Carolina	192 91	202 42	395 33
Oregon .....	.....	25,999 58	25,999 58
South Carolina	8 12	16 19	24 31
Utah	299,479 55	713,497 87	1,012,977 42
Vermont .....	.....	43 48	43 48
Refined silver	1,767,807 11	9,519,193 06	11,287,000 17
Parted from gold	79,468 95	127,656 37	207,125 32
Contained in gold	5,847 13	.....	5,847 13
Other sources	8,921,101 85	457,605 93	9,378,707 78
Total	15,642,997 58	17,176,219 40	32,819,216 98

DISPOSITION OF DOMESTIC PRODUCTION.

A reliable test of the accuracy of estimates of total production is their agreement with the statistics which show the disposition annually made of the precious metals.

Nearly all of the gold and a large portion of the silver produced in the United States during the last year was coined at the mints or used in domestic manufactures, arts, and ornamentation. The surplus was exported to non-producing countries.

The amount annually used for coinage and exported is readily ascertained. The mint records show the one and the customs returns the other. Foreign coin and bullion are now reported separately from domestic. But to obtain accurate statistics of the amount annually consumed by abrasion or loss of coin, and used in the arts, manufactures, and ornamentation is a very difficult task. The annual consumption or appropriation of the precious metals for the latter purpose was placed by Humboldt, in 1803, at \$6,000,000 for France and \$23,000,000 for Europe. Mr. William Jacob, in 1831, from a careful review of the various occupations using gold and silver in manufactures and ornamentation, made the annual consumption in the British Kingdom, for other purposes than coin, to be gold of the value of \$8,183,000, and silver \$4,100,000. His conclusions for Europe, then, were that gold and silver were thus annually used to the value of, in—

Great Britain	\$12,285,000
France	6,000,000
Switzerland	1,750,000
The remaining countries	8,025,000
	28,060,000

He estimated that the United States consumed one-twentieth part as much as Europe. He placed the consumption for these purposes in both Europe and America, at \$29,466,250, leaving for coinage as money but 10½ millions annually of the 40 millions then regarded as the world's annual production.

The estimates of the amount of gold and silver annually consumed in the United States in the manufactures, the arts, and ornamentation at the present time widely vary.

In computations heretofore made by this office it has been placed at \$5,000,000, and at the highest \$6,000,000, while in the report of the silver commission it was given as a conjecture that the annual consumption of silver was \$10,000,000 in the United States for the arts and manufacturing purposes and \$50,000,000 in all countries outside of Asia.

In order to arrive at an approximate estimate of the consumption of gold and silver in the United States, I directed an examination to be made at the mints and assay offices manufacturing fine bars, of their books for the last six years, and a report to be made of the amount of fine bars of gold and silver prepared and issued for manufacturing purposes.

The reports show that during the above period of time there were issued for manufacturing purposes \$21,879,040 of gold, and \$22,250,283 of silver, being an annual average consumption of gold bullion obtained from the New York assay-office alone of \$3,646,506, and \$3,708,380 of silver bullion.

The amount paid out at that office for these purposes during the last year was \$2,901,844 of gold, and \$4,482,975 of silver.

Full one-half of the total bullion product of the country is parted and refined by private enterprise, and a considerable portion of the gold and silver used by manufacturers comes from such refineries. I have assumed that one-fourth of the total consumption for this purpose is of bullion other than New York assay-office bars. This is a moderate estimate for the additional amount, including, as it does, all supplies from private sources and refineries and bars issued by the coinage mints and by the other assay-offices.

I have attempted to secure further statistics of the consumption in the United States by addressing circular letters to all manufacturers whose addresses I could obtain, who consume gold or silver in the preparation of chemicals and in the manufacture of jewelry, watch-cases, and other solid or plated wares. The circular referred to requested that they would specify the various forms of the metals used, whether United States coin, foreign coin, and old manufactured articles reworked or bullion. The replies that have been received, while incomplete as to the total consumption, are valuable in exhibiting the proportion of the different specified forms used, and also show that the gross amount would be in excess of estimates previously made.

The total consumption reported is as follows:

	United States coin.	Old manufactured articles, including foreign coin.	Bullion bars and native grains.	Total.
Gold.....	\$1, 473, 259	\$386, 160	\$3, 989, 081	\$5, 848, 500
Silver.....	179, 905	144, 239	2, 238, 588	2, 612, 733
Total	1, 653, 164	530, 399	6, 277, 669	8, 461, 233

Out of 3,506 addressed, 1,401 replies were received; and of the latter, 448 were manufacturing and consuming gold and silver, and reported the above amounts; leaving 2,105 not heard from. It is obvious that the estimates of this office are not in excess of what probably would have been reported as the actual amount of the precious metals used had complete and full returns been made.

From all the information obtained it may be safely assumed that the annual consumption in the United States of precious metals in all forms now averages seven million dollars of gold and five million dollars of silver, making a total of twelve million dollars; and fuller statistics may show a greater amount thus used. In estimating the amount of domestic production appropriated annually for this use, I have added one-third to the value of such bars furnished from the New York assay-office, which gives the following consumption for the last fiscal year:

Gold \$3,869,125, and silver \$5,977,300; and an average annual consumption, for the last six years, of gold \$4,458,104, and silver \$4,854,527. The annual coinage export and consumption of bullion produced in the United States (not including old plate and coin) for the last and five preceding years appears from data received, to be as follows:

GOLD.

Fiscal years.	Coinage.	Used in arts and manufactures.	Exported (reported by Bureau of Statistics).	Total.
1874.....	\$25,034,031	\$4,578,328	\$3,878,543	\$33,490,902
1875.....	25,851,983	5,382,098	2,233,775	33,467,856
1876.....	33,887,086	4,153,184	1,888,896	39,929,166
1877.....	42,125,662	3,687,192	1,084,536	46,897,390
1878.....	45,922,340	5,078,701	205,319	51,206,360
1879.....	35,005,959	3,869,125	24,774	38,899,858

SILVER.

Fiscal years.	Coinage.	Used in arts and manufactures.	Exported (reported by Bureau of Statistics).	Total.
1874.....	\$5,764,538	\$4,406,560	\$27,153,496	\$37,324,594
1875.....	10,291,805	4,237,841	17,197,914	31,727,560
1876.....	19,730,654	3,812,018	15,240,344	38,783,016
1877.....	24,543,939	8,774,240	11,475,394	39,793,573
1878.....	25,036,188	5,210,152	15,035,045	45,281,385
1879.....	22,951,768	5,977,300	11,883,064	40,812,132

GOLD AND SILVER USED IN THE ARTS AND MANUFACTURES.

UNITED STATES ASSAY-OFFICE AT NEW YORK,

September 19, 1879.

SIR: Referring to your letters of May 7 and September 4, I herewith transmit statement of the probable amount of gold and silver bullion consumed in the arts and manufactures annually from July 1, 1873, to June 30, 1879.

Of necessity these figures are approximate only. For reasons unexplained depositors of "jewelers" bars and "kings" refuse to state their character.

The information which you desired in your letter of May 7, 1879, was the amount of bullion used in the arts, derived from deposits of, 1st. Coin; 2d. "Foreign bullion"; 3d. Plate, jewelry, and "base bars"; 4th. Domestic bullion.

The 1st and 2d classifications are too inconsiderable to note; I have therefore confined my report to the 3d and 4th.

The estimate is based upon the supposition that the majority of small bars drawn by bankers from this office is disposed of to manufacturing jewelers. As it is hardly probable that such bars should form any portion of the bullion exported, inasmuch as the custom exists abroad of imposing a tax for assaying upon each bar, regardless of its weight or value, shippers of bullion preferring bars of the largest dimensions that can be conveniently handled with the view of lessening the assay charge.

Very respectfully,

J. M. FLOYD,
Acting Superintendent.

Hon. H. C. BURCHARD,
Director of the Mint, Washington, D. C.

Statement of amount of bullion derived from deposits at the assay-office at New York and Mint at Philadelphia, used in the arts and manufactures, from July 1, 1873, to June 30, 1879.

ASSAY-OFFICE AT NEW YORK.

Fiscal year.	Gold.		Silver.	
	Plate, &c.	Domestic bullion.	Plate, &c.	Domestic bullion.
1874.....	\$230,000	\$3,433,746	\$74,000	\$3,304,920
1875.....	315,000	4,036,574	114,000	3,178,381
1876.....	230,000	3,114,888	104,000	2,859,014
1877.....	226,000	2,765,394	153,000	2,830,680
1878.....	202,000	3,809,026	121,000	3,907,614
1879.....	225,000	2,901,844	123,000	4,482,975
	1,428,000	20,061,472	689,000	20,563,384

MINT AT PHILADELPHIA.

Fiscal year.	Gold.			Silver.		
	Plate, &c.	Domestic bullion.	United States and foreign coin.	Plate, &c.	Domestic bullion.	New York assay-office bars.
1874.....	\$36,761 59	\$1,507 83	\$57,046 79	\$171,843 74	\$17,466 11	\$112,127 56
1875.....	21,376 49	1,076 12	18,261 31	44,074 54	103,717 00	130,281 20
1876.....	27,491 79		10,028 22	23,572 99	22,622 81	39,857 18
1877.....	46,958 72		17,307 13	17,962 93	16,508 90	51,927 26
1878.....	47,789 73		13,964 10	32,785 44	44,286 94	24,666 88
1879.....	50,982 00		39,015 82	32,128 88	72,516 76	20,968 58
	231,360 32	2,583 95	155,623 37	322,368 52	277,118 02	879,828 66

NEW YORK, *October, 28, 1879.*

DEAR SIR: I am in receipt of your letter of 20th instant, and should have given a prompt reply to your inquiries, but have delayed in order to obtain more reliable information on the subject. We have furnished to manufacturers a large amount of fine silver bars of private refiners without passing through the assay-office. Then there is a large amount of granulated silver used in the arts, much of which does not pass through said office, amounting to at least 1,000,000 ounces. Some of the manufacturers use Mexican dollars. Our trade and standard dollars are not used now, being too *valuable* to be melted into bullion. There have been some of our assay bars exported, but in *small* amounts, amounting in my estimation to about one-half of the silver bars furnished by private refiners for the arts. I think, from the best information I can obtain, that you would be safe in estimating 1,000,000 ounces of fine silver to be added to the report of assay-office and gold at least \$2,000,000. I know that some of our largest manufacturers use only *gold coin*, and then our private refineries buy large amounts of gold and gold dust, which they roll into plate, &c., for manufacturers.

The facts, if ever obtained, will show that we are using \$10,000,000 of gold and silver annually for the arts, &c., in this country. Our only consolation is that it adds in retaining it here.

Very respectfully, yours,

PARKER HANLY.

Hon. HORATIO C. BURCHARD,
Director of the Mint, Washington, D. C.

Table showing the annual consumption of United States coin, old manufactured articles (including foreign coin), and domestic bullion, compiled from returns received in answer to a circular letter of the Director of the Mint under date of September 10, 1879.

Classes of manufacture.	Number letters sent.	Number answers received.	Manufacturing.	Non-manufacturing, not	Not replying.	United States coin.	
						Gold.	Silver.
Watches and jewelry.....	2,953	1,184	366	818	1,769	\$1,277,216	\$39,020
Watch-cases.....	73	32	11	21	41	146,468	6,324
Leaf.....	38	16	13	3	22	39,400	2,620
Plate.....	144	59	31	28	85	1,470	1,485
Chemicals.....	105	44	7	37	61	6,520	130,334
Instruments.....	193	66	20	46	127	2,185	123
	3,506	1,401	448	953	2,105	1,473,259	179,906

Classes of manufacture.	Foreign coin and bullion.		Domestic bullion.		Total.		Total gold and silver.
	Gold.	Silver.	Gold.	Silver.	Gold.	Silver.	
Watches and jewelry.....	\$305,615	\$91,086	\$2,771,386	\$406,415	\$4,354,217	\$536,521	\$4,890,738
Watch-cases.....	20,000	2,000	516,743	80,682	683,211	89,006	772,217
Leaf.....	52,176	5,613	650,919	23,482	742,495	31,715	774,210
Plate.....	7,800	22,500	45,965	1,661,688	55,235	1,685,673	1,740,908
Chemicals.....	504	23,000	4,068	114,846	11,092	268,180	279,272
Instruments.....	65	40	-----	1,475	2,250	1,638	3,888
	386,160	144,239	3,989,081	2,288,588	5,848,500	2,612,733	8,461,233

CONSUMPTION OF THE PRECIOUS METALS.

[From Report of Director of the Mint for 1880.]

The investigation of the annual use and consumption of the precious metals in ornamentation manufactures and the arts was prosecuted in the same manner as in the previous years. A greater number of persons were addressed, and replies received, the latter showing a much greater quantity of gold and silver consumed than previously reported.

Seven thousand two hundred and ninety circular letters were addressed to parties using gold and silver in the arts and manufactures; two thousand seven hundred and ninety-one replies were received; and of the latter, one thousand three hundred and eighty-one were manufacturing.

A table is submitted showing the respective amounts of the different manufactures using gold and silver.

The amounts reported as consumed are—

	United States coin.	Fine bars.	Old articles and foreign coin.	Total.
Gold.....	\$2,408,768	\$5,511,047	\$714,378	\$8,634,193
Silver.....	541,834	2,749,190	173,145	3,464,169
Total.....	2,950,602	8,260,237	887,523	12,098,362

The New York assay-office reports the value of bars made and delivered during the year for use in the arts and manufacturing, from description of bullion, as follows:

Bars manufactured from—	Gold.	Silver.	Total.
United States coin (defaced)	\$4, 929	\$982	\$5, 911
Foreign coin	260, 222	72, 668	332, 890
Foreign bullion	1, 007, 400	278, 622	1, 286, 022
Domestic bullion	2, 988, 422	3, 863, 126	6, 851, 548
Plate, &c.	394, 871	144, 992	539, 863
Total	4, 655, 844	4, 360, 390	9, 016, 234

The replies made to the circulars from the Mint Bureau show a consumption of about \$1,000,000 greater of fine gold bars, and \$1,600,000 less silver bars, than reported by the New York assay-office.

Doubtless both statements are below the amount of gold as well as silver actually appropriated during the year for use in the arts, ornamentation, and manufactures.

The estimate of last year that in the form of bullion, coin, or plate, &c., \$5,000,000 of silver and \$7,000,000 of gold were during the present year appropriated for purposes other than coin circulation, is sustained as to silver and increased as to gold to \$10,000,000, if not more.

An examination and comparison of these statements and of the value of the fine bars issued from all the mints lead to the conclusion that probably \$5,500,000 of gold and \$4,000,000 of silver of domestic bullion produced during the year, together with \$2,500,000 gold and \$600,000 silver United States coin, were thus consumed.

The estimated disposition made of the amount of gold and silver bullion in the mints and New York assay-office at the commencement and deposited during the year, and amounts held by each at the close of the year, are presented in tabulated statements in the appendix.

Table exhibiting the value and character of the gold and silver used in manufactures and the arts in the United States during the fiscal year ended June 30, 1880, as reported by persons and firms engaged in the manufactures named, in response to circular inquiries addressed from the Bureau of the Mint.

Manufactures of—	Number of letters sent.	Answers.	Number manufacturing.	Not replying.	Gold.				Silver.				Total.	Grand total.
					United States coins up.	Fine bars used.	Foreign coins and old manufactures made into new work.	Total.	United States coins melted and worked up.	Fine bars used.	Foreign coins and old manufactures made into new work.	Total.		
Watches and jewelry.....	6,444	2,451	1,172	2,821	\$2,005,983	\$3,901,952	\$610,651	\$6,517,986	\$104,400 00	\$777,483	\$77,639 00	\$859,642	\$7,477,628	
Watch-cases and manufactures.....	309	110	77	129	203,180	947,641	52,031	1,202,872	420,912 50	1,351,901	44,434 50	1,817,248	3,020,120	
Gold leaf and plate.....	333	153	103	177	183,520	633,869	44,040	860,929	14,746 00	541,636	49,887 00	606,329	1,457,258	
Chemicals.....	84	35	9	40	14,575	34,635	6,200	55,410	25 00	76,494	.....	76,519	131,929	
Instruments.....	120	42	20	58	1,510	4,050	1,436	6,996	1,691 00	1,616	1,125 00	4,432	11,428	
Totals.....	7,290	2,791	1,381	3,118	2,408,768	5,511,047	714,378	8,634,103	541,834 50	2,749,190	173,145 50	3,464,170	12,098,363	

Coinage executed during the fiscal year ended June 30, 1880.

Denomination.	Mint at Philadelphia.		Mint at San Francisco.		Mint at Carson.		Mint at New Orleans.		Total.	
	Pieces.	Value.	Pieces.	Value.	Pieces.	Value.	Pieces.	Value.	Pieces.	Value.
GOLD.										
Double-eagles.....	110,870	\$2,217,400 00	980,800	\$19,216,000 00	1,773	\$35,450 00	2,325	\$46,500 00	1,075,768	\$21,515,360 00
Eagles.....	1,403,710	14,097,100 00	461,250	4,612,500 00	4,472	44,720 00	8,200	82,000 00	1,883,632	18,836,320 00
Half-eagles.....	2,261,950	11,309,750 00	862,800	4,314,500 00	33,322	166,610 00	.....	.....	3,158,172	15,790,860 00
Three dollars.....	3,030	9,090 00	.....	.....	.....	.....	.....	.....	3,030	9,090 00
Quarter-eagles.....	1,230	3,075 00	.....	.....	.....	.....	.....	.....	1,230	3,075 00
Dollars.....	3,030	3,030 00	.....	.....	.....	.....	.....	.....	3,030	3,030 00
Total gold.....	3,789,820	27,639,445 00	2,284,950	28,143,000 00	39,567	246,790 00	10,525	128,500 00	6,124,862	56,157,735 00
SILVER.										
Dollars.....	15,135,750	15,135,750 00	7,910,000	7,910,000 00	408,000	408,000 00	4,430,000	4,430,000 00	27,933,750	27,933,750 00
Half-dollars.....	6,550	3,275 00	.....	.....	.....	.....	.....	.....	6,550	3,275 00
Quarter-dollars.....	13,350	3,337 50	.....	.....	.....	.....	.....	.....	13,350	3,337 50
Dimes.....	15,750	1,575 00	.....	.....	.....	.....	.....	.....	15,750	1,575 00
Total silver.....	15,223,400	15,194,437 50	7,910,000	7,910,000 00	408,000	408,000 00	4,430,000	4,430,000 00	27,971,400	27,942,437 50
MINOR.										
Five cents.....	24,950	1,247 50	.....	.....	.....	.....	.....	.....	24,950	1,247 50
Three cents.....	32,750	982 50	.....	.....	.....	.....	.....	.....	32,750	982 50
One cent.....	26,774,150	267,741 50	.....	.....	.....	.....	.....	.....	26,774,150	267,741 50
Total minor.....	26,831,850	269,971 50	.....	.....	.....	.....	.....	.....	26,831,850	269,971 50
Total coinage.....	45,845,070	43,103,854 00	10,194,950	36,053,000 00	447,567	654,790 00	4,440,525	4,568,500 00	60,928,112	84,370,144 00

Coinage executed at the United States mints during the calendar year 1880.

Denomination.	Philadelphia.		San Francisco.		Carson.		New Orleans.		Total.	
	Pieces.	Value.	Pieces.	Value.	Pieces.	Value.	Pieces.	Value.		
GOLD.										
Double-eagles.....	51,456	\$1,029,120 00	836,000	\$16,720,000 00					887,456	\$17,749,120 00
Eagles.....	1,644,876	16,448,760 00	506,250	5,062,500 00	11,190	\$111,900 00			2,171,516	21,715,160 00
Half-eagles.....	3,166,436	15,832,180 00	1,348,900	6,744,500 00	51,017	255,085 00	9,200	\$92,000 00	4,566,353	22,831,765 00
Three dollars.....	1,036	3,108 00							1,036	3,108 00
Quarter-eagles.....	2,996	7,490 00							2,996	7,490 00
Dollars.....	1,636	1,636 00							1,636	1,636 00
Total gold.....	4,868,436	33,322,294 00	2,691,150	28,527,000 00	62,207	366,985 00	9,200	92,000 00	7,630,993	62,308,279 00
SILVER.										
Dollars.....	12,601,355	12,601,355 00	8,900,000	8,900,000 00	591,000	591,000 00	5,305,000	5,305,000 00	27,397,355	27,397,355 00
Half-dollars.....	9,755	4,877 50							9,755	4,877 50
Quarter-dollars.....	14,955	3,738 75							14,955	3,738 75
Dimes.....	37,355	3,735 50							37,355	3,735 50
Total silver.....	12,663,420	12,613,706 75	8,900,000	8,900,000 00	591,000	591,000 00	5,305,000	5,305,000 00	27,439,420	27,409,706 75
MINOR.										
Five cents.....	19,955	997 75							19,955	997 75
Three cents.....	24,955	748 65							24,955	748 65
One cent.....	38,964,955	389,649 55							38,964,955	389,649 55
Total minor.....	39,009,865	391,395 95							39,009,865	391,395 95
Total coinage.....	56,541,721	46,327,396 70	11,591,150	37,427,000 00	653,207	957,985 00	5,314,200	5,397,000 00	74,100,278	90,109,381 70

Coined also at the Mint at Philadelphia 1,987 proof trade-dollars.

Coinage executed during the calendar years 1877, 1878, 1879, and 1880.

Denomination.	1877.	1878.	1879.	1880.
GOLD.				
Double-eagles	\$43,529,700 00	\$45,916,500 00	\$28,889,260 00	\$17,749,120 00
Eagles	211,490 00	1,031,440 00	6,120,320 00	21,715,160 00
Half-eagles	177,660 00	1,427,470 00	3,727,155 00	22,831,765 00
Three-dollars	4,464 00	246,970 00	9,000 00	3,108 00
Quarter-eagles	72,630 00	1,160,650 00	331,225 00	7,490 00
Dollars	3,920 00	3,020 00	3,030 00	1,636 00
Total gold	43,999,864 00	49,786,052 00	39,080,080 00	62,308,279 00
SILVER.				
Trade-dollars	13,092,710 00	4,259,900 00	*1,541 00	.....
Standard dollars .....	.....	22,495,550 00	27,560,100 00	27,397,355 00
Half-dollars	7,540,255 00	726,200 00	2,950 00	4,877 50
Quarter-dollars	6,024,927 50	849,200 00	3,675 00	3,738 75
Twenty-cents	102 00	120 00	.....	.....
Dimes	1,735,051 00	187,880 00	1,510 00	3,735 50
Total silver	28,393,045 50	28,518,850 00	27,569,776 00	27,409,706 75
MINOR.				
Five-cents .....	.....	117 50	1,455 00	997 75
Three-cents .....	.....	70 50	1,236 00	748 65
One-cent	8,525 00	57,998 50	162,312 00	389,649 55
Total minor	8,525 00	58,186 50	165,003 00	391,395 95
Total coinage	72,401,434 50	73,363,088 50	66,814,859 00	90,109,381 70

* Proof pieces.

Bars manufactured at the Mint during the fiscal year ended June 30, 1880.

Description.	Mints.				
	Philadelphia.	San Francisco.	Carson.	Denver.	New Orleans.
GOLD.					
Fine bars	\$145,200 85				
Mint bars					
Unparted bars			\$1,980 84	\$346,072 72	
Total gold	145,200 85		1,980 84	346,072 72	
SILVER.					
Fine bars	83,688 67	\$2,355,252 07			
Sterling bars					
Unparted bars			24,455 37	2,149 73	
Total silver	83,688 67	2,355,252 07	24,455 37	2,149 73	
Total gold and silver	228,889 52	2,355,252 07	26,436 21	348,222 45	

Description.	Assay offices.				Total.
	New York.	Boise.	Helena.	Charlotte.	
GOLD.					
Fine bars	\$11,378,980 98				\$11,524,181 83
Mint bars	57,368,761 15				57,368,761 15
Unparted bars		\$147,465 35	\$473,532 96	\$87,783 20	1,056,835 07
Total gold	68,747,742 13	147,465 35	473,532 96	82,873 20	69,949,778 05
SILVER.					
Fine bars	4,372,705 02				6,811,645 76
Sterling bars	24,347 93				24,347 93
Unparted bars		264 95	61,068 23	569 20	88,507 48
Total silver	4,397,052 95	264 95	61,068 23	569 20	6,924,501 17
Total gold and silver	73,144,795 08	147,730 30	534,601 19	88,352 40	76,874,279 22

Statement of imports and exports of gold and silver during the fiscal year ended June 30, 1880.
(Reported by Chief of Bureau of Statistics.)

[From report of the Director of the Mint.]

IMPORTS.

Ports.	Gold.			Silver.				Total.
	Bullion.	Coin.		Bullion.	Coin.			
		American.	Foreign.		American.			
					Trade-dollars.	Other.		
NEW YORK.								
July, 1879	\$29,467	\$22,690	\$71,843	\$10,274	\$265,078	\$189,032	\$132,252	\$720,636
August, 1879	3,466,940	602,612	2,091,384	6,847	43,836	256,864	244,037	6,712,520
September, 1879	5,145,857	3,865,886	18,126,926	5,950	275	178,962	275,991	27,599,847
October, 1879	3,588,353	3,116,307	12,279,384	4,531	132,358	312,830	130,434	19,564,197
November, 1879	4,737,904	6,553,626	5,768,541	16,020	99,588	81,836	357,394	17,614,909
December, 1879	1,591,009	1,931,578	2,425,980	4,960	54,361	107,591	715,027	6,830,506
January, 1880	459,360	13,995	51,605	1,245	94	174,072	181,136	881,507
February, 1880	13,879	64,374	199,666	-----	22,296	162,719	509,107	972,041
March, 1880	154,758	13,332	135,760	698	899	140,148	347,310	792,905
April, 1880	46,762	15,225	16,464	3,580	9,737	146,791	167,131	405,690
May, 1880	8,747	18,069	11,158	90,564	53,517	130,218	230,304	542,577
June, 1880	55,492	27,359	470,433	494	17,041	169,888	280,203	1,020,910
Total	19,298,528	16,245,053	41,649,144	145,163	699,080	2,050,951	3,570,326	83,658,245
SAN FRANCISCO.								
July, 1879	80,862	11,994	-----	123,698	-----	20,210	191,721	428,485
August, 1879	127,484	6,467	1,700	122,878	3,420	17,030	200,592	479,571
September, 1879	147,125	10,689	4,835	101,653	-----	9,896	159,380	433,578
October, 1879	100,222	16,601	620	153,374	-----	13,414	213,579	497,810
November, 1879	237,451	15,257	71,240	86,211	25,015	12,853	129,873	577,900
December, 1879	83,921	8,596	140,555	76,698	40,500	15,467	345,276	711,013
January, 1880	7,054	9,900	115,900	83,369	-----	5,853	251,322	473,398
February, 1880	46,650	3,929	15,500	238,000	15,000	7,517	93,781	420,377
March, 1880	37,932	6,809	32,412	120,084	-----	28,164	401,751	627,152
April, 1880	-----	35,883	21,521	168,931	-----	11,509	354,695	592,539
May, 1880	20,601	40,353	-----	123,370	-----	116,388	122,851	423,563
June, 1880	52,976	27,926	-----	107,670	-----	9,119	180,489	378,180
Total	942,278	194,404	404,283	1,505,936	83,935	267,420	2,645,310	6,043,566
ALL OTHER PORTS.								
July, 1879	4,888	18,872	10,765	47,372	-----	30,461	21,622	133,980
August, 1879	1,899	401,080	23,747	66,730	-----	13,918	66,352	573,726
September, 1879	50	203,920	22,794	3,936	43	13,685	83,734	328,162
October, 1879	10,400	50,291	16,453	30,640	-----	47,311	4,700	159,795
November, 1879	2,860	13,123	23,832	16,306	-----	28,922	117,998	203,041
December, 1879	60,583	305,827	14,601	1,957	-----	15,191	120,933	518,192
January, 1880	756	130,205	6,793	300	-----	3,300	87,805	229,159
February, 1880	799	110,573	9,103	1,360	-----	6,678	28,897	157,410
March, 1880	4,306	502,537	4,334	110,784	4	11,617	61,793	695,375
April, 1880	1,531	26,145	2,851	38,997	-----	6,011	68,212	143,797
May, 1880	8,055	5,465	11,132	12,844	-----	10,847	107,754	156,097
June, 1880	462	64	13,560	-----	-----	13,512	6,167	33,765
Total	96,639	1,768,102	159,965	330,326	47	201,453	775,967	3,332,499
Total imports	20,337,445	18,207,559	42,213,392	1,981,425	783,062	2,319,824	6,991,603	93,034,310

Statement of imports and exports of gold and silver, &c.—Continued.

EXPORTS (DOMESTIC).

Ports.	Gold.		Silver.			Total.
	Bullion.	Coin.	Bullion.	Coin.		
				Trade-dollars.	Other.	
NEW YORK.						
July, 1879.....	\$649	\$5,000	\$307,451	.....	.....	\$313,100
August, 1879.....	971	3,325	182,600	.....	.....	186,896
September, 1879.....	500	108,400	155,612	.....	\$65,660	330,172
October, 1879.....	.....	5,650	196,415	.....	82,885	284,950
November, 1879.....	.....	7,000	135,000	.....	48,053	190,053
December, 1879.....	.....	381	305,315	.....	67,100	372,796
January, 1880.....	.....	112,700	245,000	.....	9,350	367,050
February, 1880.....	.....	12,400	192,000	.....	7,515	211,915
March, 1880.....	43,667	14,025	108,000	.....	22,525	188,217
April, 1880.....	.....	15,000	15,000	.....	.....	30,000
May, 1880.....	.....	8,000	95,000	.....	5,000	108,000
June, 1880.....	.....	25,413	311,500	.....	15,000	351,913
Total.....	45,787	317,294	2,248,893	.....	323,088	2,935,062
SAN FRANCISCO.						
July, 1879.....	1,280	39,360	155,009	\$7,962	21,400	225,011
August, 1879.....	3,080	26,788	804,622	7,390	.....	841,880
September, 1879.....	2,645	11,398	529,838	13,325	.....	557,206
October, 1879.....	13,635	40,230	347,804	11,900	240	413,809
November, 1879.....	8,615	53,872	192,718	1,406	.....	256,611
December, 1879.....	8,801	91,800	1,154,738	400	1,000	1,256,739
January, 1880.....	.....	11,915	419,665	.....	500	432,080
February, 1880.....	1,367	18,207	269,125	1,000	19,226	308,925
March, 1880.....	286	14,373	17,700	.....	102,600	134,959
April, 1880.....	550	31,042	72,001	.....	500	104,093
May, 1880.....	.....	48,513	666,299	.....	9,000	723,812
June, 1880.....	1,020	55,534	34,452	.....	21,600	112,606
Total.....	41,279	443,032	4,663,971	43,383	176,066	5,367,731
ALL OTHER PORTS.						
July, 1879.....	.....	300,000	.....	.....	1,641	301,641
August, 1879.....	.....	316,500	.....	.....	670	317,170
September, 1879.....	.....	8,500	.....	.....	725	9,225
October, 1879.....	.....	226,311	.....	.....	3,857	230,168
November, 1879.....	.....	34,762	.....	.....	1,800	36,562
December, 1879.....	.....	30,822	.....	.....	315	31,137
January, 1880.....	.....	4,600	.....	.....	20,336	24,936
February, 1880.....	.....	838	.....	.....	29,368	30,206
March, 1880.....	.....	2,314	.....	.....	14,426	16,740
April, 1880.....	.....	500	.....	.....	6,857	7,357
May, 1880.....	.....	2,500	.....	.....	12,703	15,203
June, 1880.....	.....	.....	.....	.....	24,755	24,755
Total.....	.....	927,647	.....	.....	117,453	1,045,100
Total domestic exports.....	87,066	1,687,973	6,912,864	43,383	616,607	9,347,893

Statement of imports and exports of gold and silver, &c.—Continued.

EXPORTS (FOREIGN).

Ports.	Gold.		Silver.		Total.
	Bullion.	Coin.	Bullion.	Coin.	
NEW YORK.					
July, 1879.....	\$1,500		\$46,703	\$162,493	\$210,696
August, 1879.....			199,725	70,923	270,648
September, 1879.....		\$1,000	40,000	144,089	185,089
October, 1879.....				239,803	239,803
November, 1879.....		1,750	17,681	458,424	477,855
December, 1879.....		300		267,058	267,358
January, 1880.....		96,990	4,500	352,729	454,219
February, 1880.....		116,800	2,000	274,307	393,107
March, 1880.....	102,704	989,310		349,481	1,441,495
April, 1880.....		42,100		122,533	164,633
May, 1880.....		47,484		323,285	370,769
June, 1880.....		459,394		203,508	662,902
Total.....	104,204	1,755,128	310,609	2,968,633	5,138,574
SAN FRANCISCO.					
July, 1879.....		1,990	13,900	157,490	173,380
August, 1879.....				212,421	212,421
September, 1879.....				149,308	149,308
October, 1879.....				324,730	324,730
November, 1879.....				146,205	146,205
December, 1879.....		2,452		251,522	253,974
January, 1880.....				140,214	140,214
February, 1880.....				325,913	325,913
March, 1880.....				205,231	205,231
April, 1880.....				110,300	110,300
May, 1880.....				487,747	487,747
June, 1880.....				102,819	102,819
Total.....		4,442	13,900	2,613,900	2,632,242
ALL OTHER PORTS.					
July, 1879.....					
August, 1879.....				1,325	1,325
September, 1879.....					
October, 1879.....					
November, 1879.....					
December, 1879.....		212		173	385
January, 1880.....					
February, 1880.....					
March, 1880.....				22,500	22,500
April, 1880.....					
May, 1880.....					
June, 1880.....					
Total.....		212		23,998	24,210
Total foreign exports.....	104,204	1,759,782	324,509	5,606,531	7,795,026

Imports and exports of gold and silver coin and bullion during the calendar year 1880.
(From Bureau of Statistics.)

IMPORTS.

Ports.	Gold.			Silver.				Total.
	Bullion.	Coin.		Bullion.	Coin.			
		Ameri- can.	Foreign.		American.		Foreign.	
					Trade dollars.	Other.		
New York.....	\$15,251,008	\$5,453,558	\$48,792,286	\$104,047	\$144,915	\$1,630,349	\$3,813,943	\$75,190,106
San Francisco	1,082,357	203,733	611,783	1,633,248	44,600	281,580	2,390,629	6,247,930
All other ports	32,187	2,029,720	188,066	372,659	4	144,860	1,070,191	3,837,687
Total	16,365,552	7,687,011	49,592,135	2,109,954	189,519	2,056,789	7,274,763	85,275,723

Imports and exports of gold and silver coin and bullion, &c.—Continued.

EXPORTS OF DOMESTIC COIN AND BULLION.

Ports.	Gold.		Silver.			Total.
	Bullion.	Coin.	Bullion.	Coin.		
				Trade dollars.	Other.	
New York	\$43, 667	\$275, 498	\$3, 738, 420	.....	\$168, 498	\$4, 226, 083
San Francisco	35, 516	673, 942	3, 063, 208	\$1, 000	182, 926	3, 956, 592
All other ports		99, 907	.....		133, 320	233, 227
Total	79, 183	1, 049, 347	6, 801, 628	1, 000	484, 744	8, 415, 902

EXPORTS OF FOREIGN COIN AND BULLION.

Ports.	Gold.		Silver.		Total.
	Bullion.	Coin.	Bullion.	Coin.	
New York	\$102,704	\$1,821,505	\$62,400	\$3,179,935	\$5,166,544
San Francisco .....	.....	.....	.....	1,372,224	1,372,224
All other ports .....	.....	.....	.....	22,500	22,500
Total	102,704	1,821,505	62,400	4,574,659	6,561,268

Statement of the estimated disposition made of the gold and silver bullion in the coinage mints and New York assay office, deposited during and on hand at the commencement of the fiscal year ended June 30, 1880.

Disposition.	Source obtained.			Total.
	On hand June 30, 1879.	Deposited.		
		Domestic.	Coin, plate jew- elry, and for- eign bullion.	
GOLD.				
Coinage.....	\$5, 275, 424	\$28, 178, 359	\$22, 803, 952	\$56, 157, 735
Arts.....		5, 328, 739	1, 812, 623	7, 141, 362
Exports.....		87, 066		87, 066
On hand at close of the year.....		2, 227, 541	38, 496, 817	40, 724, 358
Total.....	5, 275, 424	35, 821, 705	63, 113, 392	104, 110, 521
SILVER.				
Coinage.....	5, 226, 819	20, 706, 116	2, 010, 502	27, 943, 437
Arts.....		3, 593, 645	497, 264	4, 090, 909
Exports.....		2, 322, 092		2, 322, 092
On hand at close of the year.....	752, 709	5, 510, 904		6, 263, 613
Total.....	5, 979, 528	32, 132, 757	2, 507, 766	40, 620, 051

Statement of gold and silver bullion and coin on hand at the United States mints and New York assay office, years ending June 30, 1879, and June 30, 1880.

June 30, 1879.	Philadelphia.	San Francisco.	Carson.	New Orleans.	New York.	Total.
Gold bullion ...	\$1,054,729 29	\$1,557,700 82	\$65,216 32	\$67,520 62	\$2,530,257 40	\$5,275,424 45
Gold coin	1,601,540 52	1,945,725 00	296,910 00	52,460 54	1,898,758 33	5,795,394 39
Silver bullion ...	1,909,487 30	371,984 26	87,553 42	546,701 08	3,063,801 57	5,979,527 63
Silver coin	996,375 16	351,219 22	1,031,468 35	669,555 51	136,028 14	3,184,646 38
Total	5,562,132 27	4,226,629 30	1,481,148 09	1,336,237 75	7,628,845 44	20,234,992 85

June 30, 1880.	Philadelphia.	San Francisco.	Carson.	New Orleans.	New York.	Total.
Gold bullion ...	\$9,887,445 94	\$2,042,470 73	\$185,269 98	\$27,723 17	\$28,581,428 09	\$40,724,337 91
Gold coin	3,419,347 50	749,134 18	297,784 57	67,319 67	7,503,642 63	12,037,228 55
Silver bullion ...	3,304,258 80	969,108 25	276,381 93	619,997 67	1,113,866 47	6,283,613 12
Silver coin	1,378,345 19	6,266,004 72	1,442,420 96	3,956,417 34	30,862 62	12,174,050 83
Total	17,989,397 43	10,026,717 88	2,201,857 44	3,771,457 85	37,229,799 81	71,219,230 41

COIN CIRCULATION OF THE UNITED STATES

[From Report of Director of Mint for 1880.]

The coinage and net imports of United States gold and silver coin were shown in my last annual report (p. 22) to have increased the coin circulation in six years, prior to the 1st of July, 1879, \$151,490,698 in gold, and \$107,050,985 in silver, being a total gain of \$258,541,683.

The coinage and imports during the last fiscal year have further augmented the metallic circulation as follows :

United States coin.	Gold.	Silver.	Total.
Amount June 30, 1879	\$286,490,698	\$112,050,985	\$398,541,683
Coinage less recoinage	55,948,407	27,903,139	83,851,546
Net import	16,519,586	2,642,896	19,162,482
Circulation June 30, 1880	358,958,691	142,597,020	501,555,711

During the first four months of the present fiscal year there has been a further increase by the coinage of \$14,544,599 gold, and \$9,113,000 silver, and a net import of \$1,820,591 United States gold coin, and \$567,524 United States silver coin, making the amount of United States coin—not including minor coins—in the country on the 1st of November, 1880, \$527,601,425, of which \$375,323,881 consisted of gold, 72,847,750 standard dollars, and \$79,429,794 of fractional coin and trade dollars, the latter probably amounting to \$7,000,000.

Besides the above amounts of United States coin the Treasury held on the 1st of November, in the mints and assay offices, \$78,558,811 of gold bullion, and \$6,043,367 of silver bullion, making an aggregate of coin in circulation and bullion in the Treasury of \$612,203,603, of which \$453,882,692 consists of gold coin and bullion.

The coin circulation on the 1st day of January, 1879 and 1880, based

upon the estimate for June 30, 1878,* and the subsequent net coinage and import of United States coin is as follows:

United States coin.	Gold.	Silver.	Total.
Amount June 30, 1878	\$247, 429, 570	\$80, 352, 328	\$327, 781, 898
Net coinage to January 1, 1879.....	24, 189, 858	13, 916, 814	38, 106, 672
Net import to January 1, 1879	1, 652, 279	1, 247, 570	2, 899, 849
Total January 1, 1879	273, 271, 707	95, 516, 712	368, 788, 419
Net coinage to January 1, 1880.....	38, 874, 789	27, 524, 639	66, 399, 428
Net import to January 1, 1880.....	14, 727, 586	4, 756, 343	19, 483, 929
Total January 1, 1880	326, 874, 082	127, 797, 694	454, 671, 776

The gain in coin circulation during the calendar year 1879 was \$53,602,375 in gold, and \$32,280,982 in silver, a total of \$85,883,357, and the increase in coin circulation from the date fixed for resumption, January 1, 1879, to November 1, 1880, was gold coin \$102,329,718, silver coin \$56,760,832.

This computation is exclusive of the stock of gold and silver bullion in the mints and assay offices, which held for coinage January 1, 1879, \$5,038,419 in gold, and \$11,057,091 in silver bullion, showing a gain of coin and bullion from that date to November 1, 1880, of \$175,701,904 in gold, and \$51,697,524 in silver coin and bullion available for coinage.

In the foregoing estimates the amount of United States coin consumed in the arts and manufactures, reported at about \$2,500,000 in gold and \$500,000 in silver, is not deducted for the reason that it is estimated that an equal amount of United States coin is probably brought into the country by immigrants and not reported by the custom-houses.

From the reports of the Treasurer and the Comptroller of the Currency the coin in the Treasury on the 1st of November, and in national and State banks on the 1st of October, 1880, and the estimated circulation not in the banks and Treasury appears to have been—

	Gold.	Silver.		Total.
		Legal tender.	Subsidiary.	
Treasury	\$62, 167, 141	\$47, 084, 459	\$24, 620, 489	\$133, 881, 089
National banks	95, 675, 472	*2, 500, 000	*2, 830, 357	101, 005, 829
Other banks	17, 102, 130	} 23, 263, 291	51, 969, 948	292, 714, 507
Private hands	200, 379, 138			
Total	375, 323, 881	72, 847, 750	79, 429, 794	527, 601, 425

* Not distinguished; total silver reported \$5,330,357.

Coin circulation at the close of the calendar year 1880.

United States coin.	Gold.	Silver.	Total.
Amount January 1, 1880	\$326, 874, 082	\$127, 797, 694	\$454, 671, 776
Net coinage to December 31, 1880	61, 938, 181	27, 402, 707	89, 340, 888
Net import to December 31, 1880	6, 637, 664	1, 760, 564	8, 398, 228
Total December 31, 1880.....	395, 449, 927	156, 960, 965	552, 410, 892

* Director's Report, 1879, p. 22.

COURSE OF PRICES.

[From the Report of the Director of the Mint for 1879.]

The discovery of the gold mines of California and Australia, and outpouring of their mineral wealth to that of the Old World, excited an apprehension in Europe lest an oversupply of silver and gold might diminish the purchasing power of money, disturb values, and inflate prices.

The large production of the precious metals in the last few years has been measurably absorbed by increasing wealth, wider commerce, and the more frequent interchange of commodities.

Notwithstanding the large additions to the monetary supply by the Comstock lode, the prices of commodities measured in silver as well as gold have lowered. This may in part be accounted for by the change in several European countries from the silver to the gold standard.

The Director of the Mint, in his report for 1873, predicted that "the gradual adoption of the gold standard and consequent demonetization of silver will, of course, be followed by an increase in the value of gold, or, what is the same thing, a decrease in the price of articles measured by it."

Sufficient time has elapsed since 1873 to verify this prediction and to permit an examination of the course of prices which it may be profitable to trace through the last six years.

The prices of the exports of a country are usually regulated by the prices in the markets of the world, are least disturbed by local influences, and best suited for such comparisons. The exports of this country for the last ten years, dividing value by quantity of each article, give the yearly average export price.

Rejecting a few articles of which the small quantity exported or variable quality afford no fair criterion, there remain eighty articles comprising 84 per cent. of the value of the merchandise exports of last year.

The results of a comparison of the price of each article in subsequent years with its price in 1870, added and averaged for each year, afford an indication of the general rise or fall of prices; that is, the purchasing power of money in this country for each of the ten years. Such examination shows a rise in gold prices from 1870 to 1874, and subsequent decline, the ratio of prices in each year to the prices of 1870 being in United States notes and in gold as follows:

Fiscal years ending—	Comparative currency prices of exports with their like price in 1869-'70.	Comparative gold prices of exports with their like price in 1869-'70.	Comparative purchasing value of United States notes with their like value in 1869-'70, as measured by the prices of United States exports.	Comparative purchasing value of gold with its like value in 1869-'70, as measured by the prices of United States exports.	Comparative purchasing value of silver.
1870	\$1 00	\$1 00	\$1 00	\$1 00	\$1 00
1871	95.6	1 04.7	1 04.6	95.5	95.7
1872	95.3	1 04.8	1 04.9	95.4	96.15
1873	98.7	1 06.5	1 01.3	93.8	92.8
1874	99.1	1 09	1 00.9	91.7	89.1
1875	91.9	1 00.2	1 08.8	99.8	94.8
1876	85.5	92.4	1 16.9	1 08.2	98.2
1877	82.5	94	1 21.2	1 06.3	95.7
1878	73.9	88.7	1 35.3	1 12.7	1 00
1879	67.7	86	1 47.7	1 16.2	97.9

The prices of the year 1869-'70 are nearly the average prices for the closing years of the five decades preceding the year 1879, namely, 1829, 1839, 1849, 1859, and 1869.

Examination has not been made, and it may be impossible to ascertain, whether the prices of the fiscal year 1869-'70 are average prices in this country for the last fifty years or during the century; but the prices of that year as given in English statistical authorities are about the same as for the closing year of five preceding decades, except 1849.

Similar tables of prices in Europe, combined with those of American exports above stated, show the following comparative prices of commodities and respective purchasing power of gold and silver for the last ten years:

	Prices of commodities in—		Purchasing value (measured by commodities) of—	
	Gold.	Silver.	Gold.	Silver.
1870.....	\$100	\$100	\$100	\$100
1871.....	102.2	101.1	97.9	98.9
1872.....	104.8	105	95.4	95.3
1873.....	106.4	107.7	94	92.9
1874.....	104.6	107.7	95.6	92.9
1875.....	98.3	103.3	101.8	96.8
1876.....	96.3	106.1	103.8	94.2
1877.....	95.9	107.6	104.3	93
1878.....	91.6	103.2	109.2	96.9
1879.....	86.7	103	115.3	97.1

The prices given are the average prices taken from statistical authorities for the fiscal years named of American exports and leading English commodities, and except for the last two years of French imports and exports, and indicate as to those countries the comparative average purchasing power of gold and silver respectively during the ten years.

These comparisons indicate a rise in the value of money measured in commodities in Europe, and especially during the last year in this country. From the movement of the precious metals to this country at this time, a further decline in prices may be expected on the Continent, and an advance in the United States.

Average values of the principal domestic commodities exported from the United States.

Commodities.	1870.	1871.	1872.	1873.	1874.	
Acids.....	pound..	*\$0 13.7	\$0 05.3	\$0 04.1	\$0 03.9	\$0 03.4
Ashes, pot and pearl.....	do.	07.2	07	07.6	08.7	07.7
Beer, in bottles.....	dozen..	20.9	25.9	24.2	22.3	21.5
casks.....	gallon..	35.7	32.6	35.8	35.6	33.6
Bones and bone-dust.....	cwt.	1 64.5	1 56.3	1 72.1	1 66.8	2 26.5
Bone-black, ivory-black.....	pound..	04.7	04.4	01.7	02.8	06.4
Barley.....	bushel..	54.9	58.9	72.9	66.9	65.7
Bread and biscuit.....	pound..	05.7	05.5	05.9	05.9	06
Indian corn.....	bushel..	92.4	75.9	69.5	61.7	71.8
Indian corn meal.....	barrel..	5 00.1	4 47.6	3 93.4	3 65.8	3 94.3
Oats.....	bushel..	62.9	56.2	51.3	40.6	47.
Rye.....	do.	1 13.1	89.9	88.5	83.5	1 00.2
Rye flour.....	barrel..	5 51.4	5 46.1	5 47	5 56.5	6 49.1
Wheat.....	bushel..	1 28.9	1 31.5	1 47.2	1 31.2	1 42.7
Wheat flour.....	barrel..	6 11.2	6 59.3	7 14	7 56.4	7 14.6
Bricks.....	M.	11 11.2	10 35.6	8 39	8 72.1	8 38.1
Candles.....	pound..	16.4	15	14.8	15	15.1
Coal, bituminous.....	ton.	6 63.2	5 98.3	5 29.8	5 34.1	5 56.3
other.....	do.	4 71	4 22.9	4 14.8	4 48	4 39.2
Copper, pigs, bars, sheets.....	pound..	17.4	22.8	24.2	26.7	24.5
Cordage, rope and twine.....	do.	20.5	17.9	17.1	15.8	15.1
Cotton, sea-land.....	do.	53.7	44.7	52	41.2	32.2
other, unmanufactured.....	do.	23.5	14.8	19.2	18.8	15.4
colored.....	yard..	17	14.2	16.1	16.2	14.4
uncolored.....	do.	16.2	11.9	14.8	16.2	12.6
Ginseng.....	pound..	09.5	10.4	08.5	09.7	11.2
Glue.....	do.	02.5	01.5	02	02	01.8
Hay.....	ton.	17 42.3	22 75.8	25 77.1	24 33.1	22 88.2
Hemp, cordage, rope, and twine.....	cwt.	15 25.1	18 70.7	19 75.2	18 38.9	16 78.7
Ice.....	ton.	4 06.8	4 13.4	3 79.3	3 51.2	3 83.9
Iron, pig.....	pound..	01.6	01.3	01.5	02.2	01.9
bar.....	do.	05	04.1	05.4	04.8	03.9
boiler-plate.....	do.	04.6	05.2	07.5	05.5	05.6
railroad-bars.....	do.	03.6	03.5	03.6	03.6	03.3
sheet, band, and hoop.....	do.	05.4	05.5	04.5	04.5	07.9
car-wheels.....	number..	19 91.4	18 46.8	20 97.1	17 81.6	15 94.8
Nails and spikes.....	pound..	05.7	05.1	05.4	05.9	05
Steel, ingot, bars, sheets.....	do.	11.9	15.6	12.3	30.9	39.5
Leather, sole and upper.....	do.	28.4	25.2	23.6	25.3	25.2
Boots and shoes.....	pair.	1 51.9	1 46.8	1 54.5	1 61.6	1 57.4
Lime and cement.....	barrel..	1 97.2	1 87	1 74.4	1 89.6	1 67
Rosin and turpentine.....	do.	3 04.5	3 12.6	4 70.1	4 29.7	3 27.8
Tar and pitch.....	do.	3 02.6	2 88.1	3 56.7	4 07.5	3 32
Oil-cake.....	pound..	02.1	02	01.4	01.8	01.9
Naphthas, benzine, &c.....	gallon..	10.4	10.3	11.5	15.2	10.6
Illuminating oils.....	do.	30.5	25.7	24.9	23.5	17.2
Lard-oil.....	do.	1 37.5	1 04	81.1	76.8	80.4
Sperm-oil.....	do.	1 58.9	1 28.3	1 41.2	1 44.8	1 56.2
Whale-oil.....	do.	73.4	52.5	47.1	53	47
Linseed-oil.....	do.	1 05.8	95	94.8	97.1	1 04
Gunpowder.....	pound..	15.7	24.3	20.1	17.1	20.5
Bacon and hams.....	do.	15.7	11.3	08.5	08.8	09.6
Beef, salted or cured.....	do.	04.4	08.7	06.9	07.7	08.2
Butter.....	do.	29.3	21.5	19.3	21	25
Cheese.....	do.	15.3	13.7	11.7	13	13.1
Eggs.....	dozen..	39.5	28.4	20.3	20.2	22
Fish, dried or smoked.....	cwt.	5 18.7	4 95.4	4 64.5	4 82	4 71.2
pickled.....	barrel..	8 18.5	7 63	6 82.3	6 52	7 79.3
Lard.....	pound..	16.5	13.1	10.1	09.2	09.3
Pork.....	do.	13.6	10.9	07.5	07.8	08.2
Onions.....	bushel..	1 67.5	1 38.9	97.9	1 28	1 52.6
Potatoes.....	do.	69	78.2	77.6	96.6	94.7
Quicksilver.....	pound..	40.6	73.7	80.1	87.5	1 15.7
Rice.....	do.	05.9	05	07.1	11.1	04.8
Salt.....	bushel..	40.1	39.2	46.8	59.7	46.4
Soap.....	pound..	08	07.2	06.9	06.9	06.9
Spermaceti.....	do.	32.9	26.7	29.8	28.2	25.6
Spirits of turpentine.....	gallon..	41.8	41.1	56	52.1	40.6
Starch.....	pound..	08.2	06.5	04.9	05.3	05.6
Sugar, brown.....	do.	11.2	11.2	12.7	09.2	09.9
refined.....	do.	12.5	13.1	12.5	11.5	10.4
Molasses.....	gallon..	30	24.8	22.1	19.9	23.2
Tallow.....	pound..	10.1	08.9	09.1	08.9	07.9
Tobacco, leaf.....	do.	11.3	09.2	10.2	10.6	09.5
Varnish.....	gallon..	1 58.7	1 45.6	1 37.4	1 29.4	1 51.6
Wax, bees.....	pound..	39.6	30.9	28.2	31.5	33.2
Wool, raw and fleece.....	do.	35.9	34.7	25.9	23.4	22.5
Wood, boards, &c.....	M feet..	20 73.2	17 85.3	19 50.8	19 55.4	13 50.7
Zinc, ore or oxide.....	cwt.	53.3	50.1	56.6	68.3	78.5
plate, sheets, pigs, &c.....	pound..	09.6	10.2	09.1	06.2	08.2

Average values of the principal domestic commodities exported, &c.—Continued.

Commodities.	1875.	1876.	1877.	1878.	1879.
Acids.....	..pound..	\$0 03.4	\$0 03.1	\$0 03.1	\$0 02.6
Ashes, pot and pearl.....	..do.....	06.6	05.7	05.5	05.6
Beer, in bottles.....	..dozen..	20.9	18.4	13.4	14.1
casks.....	..gallon..	26.9	29.8	27.8	32.5
Bones and bone-dust.....	..cwt.....	1 85.2	1 71	1 72.7	1 66.5
Bone-black, ivory-black.....	..pound..	04.6	04.2	04.4	02.9
Barley.....	..bushel..	07.3	06.2	59.7	65.4
Bread and biscuit.....	..pound..	05.2	05.2	05.2	05
Indian corn.....	..bushel..	84.7	67.2	59.7	56.2
Indian corn meal.....	..barrel..	4 42.4	3 68.4	3 37.3	3 08.7
Oats.....	..bushel..	57.5	40.1	40.3	34.3
Rye.....	..do.....	98.7	88.2	83.2	72.5
Rye flour.....	..barrel..	5 50	5 16.9	5 22.7	4 42
Wheat.....	..bushel..	1 12.3	1 24.1	1 16.8	1 33.7
Wheat flour.....	..barrel..	5 96.8	6 20.8	6 47.9	6 35.7
Bricks.....	..M.....	8 35.2	7 72	7 66.9	6 08.4
Candles.....	..pound..	14.7	15.1	14.5	13.9
Coal, bituminous.....	..ton.....	5 66.6	5 53.1	4 51.6	3 15.1
other.....	..do.....	4 07.9	3 69.6	3 18.5	3 37
Copper, pigs, bars, sheets.....	..pound..	20.3	21.6	20.1	18.6
Cordage, rope and twine.....	..do.....	12.8	08	12.6	11.4
Cotton, sea-land.....	..do.....	34.6	35.6	31.9	25.5
other unmanufactured.....	..do.....	15	12.8	11.7	11.1
colored.....	..yard.....	12.3	08.8	08.3	07.7
uncolored.....	..do.....	19.8	08.9	08.4	07.9
Ginseng.....	..pound..	13.2	11.7	12.7	11.8
Glue.....	..do.....	01.7	02.3	01.9	01.2
Hay.....	..ton.....	15 34.5	17 80.2	16 04.7	14 85.6
Hemp, cordage, rope, and twine.....	..cwt.....	15 37.7	13 12.5	13 44.4	12 80
Ice.....	..ton.....	3 87.6	3 44.4	3 65.1	3 53.1
Iron, pig.....	..pound..	01.3	01.1	01.2	01
bar.....	..do.....	03.2	03.2	02.9	02.3
boiler-plate.....	..do.....	05	04.5	04.8	04.7
railroad-bars.....	..do.....	02.5	02.5	02	01.7
sheet, band, and hoop.....	..do.....	05.1	04.4	03.8	04.6
car-wheels.....	..number..	19 92.4	21 70.2	16 02.1	10 86.5
Nails and spikes.....	..pound..	04.3	03.7	03.4	03
Steel, ingot, bar, sheets.....	..do.....	13	09.8	11.1	10.1
Leather, sole and upper.....	..do.....	26	26.2	23.9	21.8
Boots and shoes.....	..pair.....	1 46.5	1 39.8	1 37.9	1 33.3
Lime and cement.....	..barrel..	1 53.9	1 44.1	1 24.9	1 19.1
Rosin and turpentine.....	..do.....	2 95.9	2 65.5	2 64.9	2 23.5
Tar and pitch.....	..do.....	2 31.6	2 38.1	2 22.2	2 15.3
Oil-cake.....	..pound..	02	02	02.7	01.4
Naphthas, benzine, &c.....	..gallon..	09.7	09.7	11.9	08.5
Illuminating oils.....	..do.....	14.1	14	21.1	14.3
Lard-oil.....	..do.....	1 00.5	1 01.9	81	60.2
Sperm-oil.....	..do.....	1 72.4	1 53	1 38.5	1 10.7
Whale-oil.....	..do.....	46.1	40.8	43	45.5
Linseed-oil.....	..do.....	93.8	78.3	73	70
Gunpowder.....	..pound..	16.7	18	18.9	15.1
Bacon and hams.....	..do.....	11.4	12.1	10.7	08.7
Beef, salted or cured.....	..do.....	08.7	08.7	07.5	05.5
Butter.....	..do.....	23.6	23.8	20.5	18
Cheese.....	..do.....	13.5	12.5	11.8	11.3
Eggs.....	..dozen..	25.6	28	25.8	15.7
Fish, dried or smoked.....	..cwt.....	5 46.3	5 12.9	4 95.9	4 05.7
pickled.....	..barrel..	7 04.8	7 68.6	7 38.5	7 23
Lard.....	..pound..	13.7	13.3	10.8	08.7
Pork.....	..do.....	10.1	10.5	09	06.8
Onions.....	..bushel..	1 07.4	87.3	91.8	78.3
Potatoes.....	..do.....	85.6	61.2	1 00.6	72.7
Quicksilver.....	..pound..	1 00.9	64.1	45.3	43.1
Rice.....	..do.....	07.1	07	05.9	05.3
Salt.....	..bushel..	34.5	36	30.6	34.4
Soap.....	..pound..	06.4	06.6	06.1	05.6
Spermaceti.....	..do.....	25.8	25.4	26.7	25.5
Spirits of turpentine.....	..gallon..	34.3	32.2	33.4	30.5
Starch.....	..pound..	05.9	05.4	05.2	04.6
Sugar, brown.....	..do.....	08.5	10.5	07.7	08.5
refined.....	..do.....	10.8	10.7	11.5	10.2
Molasses.....	..gallon..	31.7	26.2	24.7	24.7
Tallow.....	..pound..	08.6	09.2	08.6	07.8
Tobacco, leaf.....	..do.....	11.2	10.4	10.2	08.7
Varnish.....	..gallon..	1 38.2	1 49.7	1 51.4	1 53
Wax, bees.....	..pound..	27.3	31.6	30.5	29.1
Wool, raw and fleece.....	..do.....	35.2	13.2	35.2	26.8
Wood, boards, &c.....	..M feet..	17 26.3	15 30.3	16 89.7	14 47.1
Zinc, ore or oxide.....	..cwt.....	67	65	53.6	52.2
plates, sheets, pigs, &c.....	..pound..	11.1	08.6	08.1	08.5

Comparative currency prices of the articles of export enumerated in the preceding table for the ten years 1870-79, inclusive, assuming the prices of 1870 as 100.

Commodities.	1870.	1871.	1872.	1873.	1874.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Acids.....pound..	*100	100	77.5	73.7	64.1
Ashes, pot and pearl.....do..	100	96.1	104	119.5	105.7
Beer, in bottles.....dozen..	100	123.9	115.7	106.7	102.8
casks.....gallon..	100	91.3	100.2	99.7	94.1
Bones and bone-dust.....cwt..	100	95	104.6	101.3	137.6
Bone-black, ivory-black.....pound..	100	93.6	86.1	59.6	136.1
Barley.....bushel..	100	107.1	132.6	121.7	119.5
Bread and biscuit.....pound..	100	96.4	103.4	103.4	108.6
Indian corn.....bushel..	100	82.1	75.2	66.8	77.7
Indian corn meal.....barrel..	100	89.5	78.6	73.1	78.8
Oats.....bushel..	100	89.4	81	64.6	75
Rye.....do..	100	79.5	78.2	73.8	88.6
Rye flour.....barrel..	100	99	99.1	100.8	117.6
Wheat.....bushel..	100	102	114.1	101.7	110.7
Wheat flour.....barrel..	100	107.8	116.8	124.7	116.9
Bricks.....M..	100	93.2	76	78.5	75.4
Candles.....pound..	100	91.5	90.2	91.5	92
Coal, bituminous.....ton..	100	90.2	80	80.4	84
other.....do..	100	89.8	88	95.1	93.2
Copper, pigs, bars, sheets.....pound..	100	131	139	153	140.8
Cordage, rope and twine.....do..	100	87.3	83.4	77.1	73.7
Cotton, sea-island.....do..	100	83	96.7	76.6	41.3
other unmanufactured.....do..	100	63	81.7	80	65.5
colored.....yard..	100	83.5	94.7	95.3	84.7
uncolored.....do..	100	73.4	91.3	100	77.7
Ginseng.....pound..	100	109	89.3	101.9	117.6
Glue.....do..	100	60	80	80	72
Hay.....ton..	100	130.3	148	139.6	131
Hemp, cordage, rope, and twine.....cwt..	100	122.7	129.5	120.6	111
Ice.....ton..	100	101.6	93.3	86.4	94.4
Iron, pig.....pound..	100	81.2	93.8	137.5	118.7
bar.....do..	100	82	108	95	78
boiler-plate.....do..	100	113	163	120	122
railroad-bars.....do..	100	97.3	100	100	91.7
sheet, band, and hoop.....do..	100	101.7	83.3	83.3	146.2
car-wheels.....number..	100	93	105.3	89.5	80.1
Nails and spikes.....pound..	100	89.5	94.7	101.7	87.7
Steel, ingot, bars, sheets.....do..	100	131	103.3	175.6	332
Leather, sole and upper.....do..	100	88.7	83	89	89
Boots and shoes.....pair..	100	97	102	106.4	104
Lime and cement.....barrel..	100	95	88.4	96.1	85
Rosin and turpentine.....do..	100	103	154.3	141.1	108
Tar and pitch.....do..	100	95.2	118	135	110
Oil-cake.....pound..	100	95.2	67	86	90.4
Naphthas, benzine, &c.....gallon..	100	99	110.5	146.1	101.9
Illuminating oils.....do..	100	84.3	82	77	56.3
Lard-oil.....do..	100	75.6	59	56	58.4
Sperm-oil.....do..	100	81	89	91.1	98.2
Whale-oil.....do..	100	72	64.1	72.1	64
Linseed-oil.....do..	100	90	90	92	98.3
Gunpowder.....pound..	100	155	128	109	131
Bacon and hams.....do..	100	72	54.1	56	61.1
Beef, salted or cured.....do..	100	198	157	175	186.3
Butter.....do..	100	73.3	66	72	85.3
Cheese.....do..	100	80	76.4	85	86
Eggs.....dozen..	100	72	51.3	51.1	50
Fish, dried or smoked.....cwt..	100	96	90	93	91
pickled.....barrel..	100	93.2	83.3	80	95.2
Lard.....pound..	100	79.3	61.2	56	56.3
Pork.....do..	100	80.1	55.1	57.3	60.2
Onions.....bushel..	100	83	58.4	76.4	91.1
Potatoes.....do..	100	113.3	112.4	140	137.2
Quicksilver.....pound..	100	182	197.2	216	285
Rice.....do..	100	85	120	188.1	81.3
Salt.....bushel..	100	98	117	149	116
Soap.....pound..	100	90	86.2	86.2	86.2
Spermaceti.....do..	100	81.1	91	86	78
Spirits of turpentine.....gallon..	100	98.3	134	125	97.1
Starch.....pound..	100	79.3	60	65	68.3
Sugar, brown.....do..	100	100	113.4	82.1	85.4
refined.....do..	100	105	100	92	83.2
Molasses.....gallon..	100	83	74	66.3	77.3
Tallow.....pound..	100	88.1	90	88.1	78.2
Tobacco, leaf.....do..	100	73	90.2	93.8	84
Varnish.....gallon..	100	92	87	82	96
Wax, bees.....pound..	100	78	71.2	80	84
Wool, raw and fleece.....do..	100	97	72.1	65.1	63
Wood, boards, &c.....per M feet..	100	86.1	95	94.3	90
Zinc, ore or oxide.....cwt..	100	94	106.1	184.3	147.1
plates, sheets, pigs, &c.....pound..	100	106.2	95	65	85.4
Average.....	100	95.6	95.3	98.7	99.1

* Assuming as the basis \$0.05.3 instead of \$0.13.7.

Comparative currency prices of the articles of export enumerated in the preceding table,
 &c.—Continued.

Commodities.	1875.	1876.	1877.	1878.	1879.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
Acids.....	64.1	58.4	58.4	56.6	49
Ashes, pot and pearl.....	90.6	73.2	75.5	76.9	78.2
Beer, in bottles.....	99.9	88	64.1	67.4	77.5
casks.....	75.3	83.5	77.9	91	105.3
Bones and bone-dust.....	112.6	104	105	102	101.5
Bone-black, ivory-black.....	97.8	89.3	93.6	61.7	100
Barley.....	122.4	120.4	108.6	119	101.8
Bread and biscuit.....	91.1	91.1	91.1	87.6	75.3
Indian corn.....	91.6	72.7	64.6	60.8	51
Indian corn meal.....	88.4	73.6	67.4	61.7	53
Oats.....	91.4	63.7	64	54.5	47.1
Rye.....	87.3	78	73.6	64	56.5
Rye flour.....	99.7	93.7	94.8	80.1	54.6
Wheat.....	87.1	96.3	80.6	103.7	82.8
Wheat flour.....	97.6	101.6	106	104	86
Bricks.....	75.2	73.5	69	54.8	59.5
Candles.....	90	92	88.4	85	75
Coal, bituminous.....	85.3	83.3	100	47.4	49
other.....	87	78.4	68	84.2	77
Copper, pigs, bars, sheets.....	117	124.1	116	106.9	91.4
Cordage, rope and twine.....	62.4	39	61.5	55.6	47.8
Cotton, sea-island.....	64.4	66.2	59.3	47.4	51
other unmanufactured.....	63.8	54.5	49.8	47.2	39.2
colored.....	72.3	51.7	48.8	45.3	41.8
uncolored.....	66.6	54.9	51.8	48.7	45.7
Ginseng.....	138.6	122.9	133.4	123.9	125
Glue.....	68	92	76	48	44
Hay.....	87.8	102.2	91.8	85	86.1
Hemp, cordage, rope, and twine.....	100.8	86	88	84	68.9
Ice.....	95.3	84.7	89.8	86.8	83.6
Iron, pig.....	81.3	68.8	75	62.5	75
bar.....	64	64	53	46	52
boiler-plate.....	109	98	104	102	67.3
railroad-bars.....	69.5	69.5	55.6	47.2	41.7
sheet, band, and hoop.....	94.4	81.4	70.3	85.1	57.4
car-wheels.....	100	109	80.4	54.6	44.1
Nails and spikes.....	75.4	65	60	53	47.3
Steel, ingot, bars, sheets.....	109.2	82.3	93.3	84.9	70
Leather, sole and upper.....	92	92.3	84.2	77	71.5
Boots and shoes.....	96.4	92	90.8	88	80.4
Lime and cement.....	78	73	63.3	60.3	62
Rosin and turpentine.....	97.2	87.2	87	73.4	64
Tar and pitch.....	76.5	79	73.4	71.1	64
Oil-cake.....	95.2	95.2	129	66.6	57.1
Naphthas, benzine, &c.....	93.2	114.4	82	81.7	80
Illuminating oils.....	46.2	46	69.1	47	35.2
Lard-oil.....	73	74.1	59	44	38.4
Sperm-oil.....	108.4	96.2	87.1	70	56
Whale-oil.....	63	56	59	61.2	46
Linseed-oil.....	89	74	69	66.1	69.2
Gunpowder.....	130	106.3	115	96.1	84
Bacon and hams.....	72.6	77	68.1	55.4	44
Beef, salted or cured.....	108	198	170.4	125	143
Butter.....	81	81.2	70	61.4	48.1
Cheese.....	88.2	82	77.1	74	56
Eggs.....	65	71	65.3	40	39.2
Fish, dried or smoked.....	105.3	99	96	78.2	73.2
pickled.....	86.1	94	90.2	88.3	74.4
Lard.....	83	81	65.4	53	42
Pork.....	74.2	77.1	68.1	50	41.1
Onions.....	64.1	52.1	55	47	55.3
Potatoes.....	124	87	146	105.3	126.2
Quicksilver.....	249	158	112	106.1	96.3
Rice.....	120	119	100	90	81.3
Salt.....	86	90	76.3	86	76
Soap.....	80	83	76.2	70	63
Spermaceti.....	79	77.2	81.1	78	73
Spirits of turpentine.....	82	77	80	73	65
Starch.....	72	66	63.4	56.1	51.2
Sugar, brown.....	76	94	69	76	64.2
refined.....	86.4	85.6	92	82	68
Molasses.....	106	87.3	82.3	82.3	65
Tallow.....	85.1	91	85.1	77.2	68.3
Tobacco, leaf.....	99.1	92	90.2	77	69
Varnish.....	87	94.3	95.3	96.4	99.1
Wax, bees.....	69	80	77	73.4	68.4
Wool, raw and fleece.....	98	37	92.4	75	81
Wood, boards, &c.....	83.2	74	82	70	70
Zinc, ore or oxide.....	126	122	101	98	71
plates, sheets, pigs, &c.....	116	90	84.4	89	83.3
Average.....	91.9	85.5	82.5	73.9	67.7

Table showing the gold and silver prices of commodities as shown by the declared values of United States exports, of French exports and imports, and from the prices current in London and Manchester (England); also showing the purchasing value of gold and silver on the basis of these prices.

Year ended June 30—	GOLD PRICES OF COMMODITIES.					Corresponding silver prices of commodities.	Corresponding purchasing power of—	
	United States.	France.		England.	Mean of preceding columns of gold prices of commodities.			
	Exports, 80 classes of commodities.	Exports.	Imports.	Wholesale prices of commodities in London and Manchester (deduced from tables in London Economist).				
2	3	4	5	6	7	Gold.	Silver.	
1870.....	100	100	100	100	100	100	100	100
1871.....	104.7	99.1	104.1	100.7	102.2	101.1	97.0	98.9
1872.....	104.8	100.3	108.7	105.5	104.8	105	95.4	95.3
1873.....	106.5	99.6	109.9	109.4	106.4	107.7	94	92.9
1874.....	109	95.6	105.7	108.1	104.6	107.7	95.6	92.9
1875.....	100.2	91.7	100.3	100.8	98.3	103.3	101.8	96.8
1876.....	92.4	91.2	99	102.6	96.3	106.1	103.8	94.2
1877.....	94	90.7	98.1	100.6	95.9	107.6	104.3	93
1878.....	88.7	-----	-----	94.5	91.6	103.2	109.2	96.9
1879.....	86	-----	-----	87.4	86.7	103	115.3	97.1

[From the Report of the Director of the Mint for 1880.]

The past fiscal year has exhibited monetary phenomena unusual and unexpected. The deficient harvests in Europe, and our unusual bounteous supply of exportable food, produced an importation of gold unchecked by advancing prices or the amount of existing circulation, already seemingly abundant. The heavy importation of foreign coin and bullion which commenced in August, 1879, continued until the close of the calendar year, and has been again resumed within the last three months. The remarkable increase of metallic circulation has been largely absorbed by the business community.

The speculative advance in prices first in the United States and then abroad subsided in part before the close of the year. Comparisons of the prices of 1880 with those of former years have been made similar to those in my last report. The table of the prices of exported commodities at different periods and for the whole of the last fiscal year shows an advance of $8\frac{1}{2}$ per cent. on the average prices of the same commodities during the fiscal year 1879, and but 6 per cent. below the gold prices of the same commodities in 1870.

Average and comparative price of the principal domestic commodities exported from the United States.

Commodities.	Average prices during month of—			Average price during year ended—		Comparative rates of 1880.	
	June, 1879.	December, 1879.	June, 1880.	June 30, 1879.	June 30, 1880.	Assuming prices of 1870 as 100.	Assuming prices of 1879 as 100.
Acids.....pound..	\$0 3.5	\$0 2.8	\$0 2.8	\$0 2.6	\$0 2.9	54.7	111.5
Hogs.....piece..	8 09.3	5 07.5	5 89.7	9 32.0	5 04.6	32.0	54.1
Horned cattle.....do..	56 33.1	61 06.8	72 34.6	61 28.7	73 01.6	21.8	119.1
Horses.....do..	160 35.0	121 27.3	144 51.0	196 86.8	220 63.3	263.6	112.0
Mules.....do..	100 98.3	115 70.6	90 00.0	127 85.6	102 41.6	72.6	80.1
Sheep.....do..	7 16.3	3 72.2	2 50.4	5 02.1	4 26.8	177.4	85.0
Ashes, pot and pearl.....pound..	5.5	6.0	7.6	5.6	8.9	123.6	158.9
Beer:							
In bottles.....dozen..	1 83.1	1 75.5	1 74.8	1 62.2	1 78.8	85.5	110.3
In casks.....gallon..	39.0	33.8	37.8	37.6	32.6	91.3	86.7
Bones and bone-dust.....cwt..	63.1	5 10.1	2 68.0	1 66.9	1 42.0	86.3	85.0
Bone-black, lamp-black.....pound..	20.9	5.4	7.4	4.7	5.2	110.6	110.6
Barley.....bushel..	39.8	64.9	46.5	56.0	69.5	126.6	124.1
Bread and biscuit.....pound..	4.2	4.5	4.2	4.3	4.6	80.7	107.0
Indian corn.....bushel..	46.1	61.9	51.5	47.1	54.2	58.6	115.0
Indian corn-meal.....barrel..	2 37.6	3 03.9	2 78.1	2 64.9	2 79.8	55.9	105.6
Oats.....bushel..	40.3	51.9	42.2	29.6	40.2	63.9	135.8
Rye.....do..	65.2	94.9	83.6	63.0	81.1	71.7	126.9
Rye flour.....barrel..	2 01.8	5 25.9	4 26.0	3 01.3	4 76.4	86.3	158.0
Wheat.....bushel..	1 07.6	1 38.0	1 27.3	1 06.8	1 24.3	96.4	116.3
Wheat flour.....barrel..	5 25.6	6 13.3	5 69.9	5 25.2	5 87.6	96.1	111.8
Bricks.....M..	6 39.2	10 42.4	8 01.0	6 60.7	7 78.4	70.0	117.8
Candles.....pound..	11.5	12.2	12.1	12.3	12.1	73.8	98.3
Coal:							
Anthracite.....ton..	2 92.6	3 82.8	4 33.0	3 23.0	3 47.1	52.3	107.4
Bituminous.....do..	2 38.1	3 48.3	3 67.2	3 62.0	3 12.2	66.2	86.2
Copper, pigs, bars.....pound..	14.9	20.1	29.3	15.9	15.8	90.8	93.0
Cordage, rope, twine.....do..	8.8	10.7	14.3	9.8	11.0	53.6	112.2
Cotton:							
Sea-land.....pound..	26.3	35.0	25.2	27.4	33.2	61.8	121.1
Other.....do..	11.5	11.5	11.6	9.2	11.5	48.9	125.0
Colored.....yard..	6.6	8.2	8.0	7.1	7.8	45.8	109.8
Uncolored.....do..	7.1	7.7	8.6	7.4	8.4	51.8	113.5
Ginseng.....pound..	1 23.2	1 45.7	1 35.8	1 19.0	1 36.2	143.3	114.4
Glue.....do..	10.1	11.0	15.7	11.1	15.0	60.0	136.3
Hay.....ton..	16 10.9	14 26.5	18 05.4	15 02.6	15 05.3	86.4	100.1
Hemp cables, cordage.....cwt..	9 77.7	10 72.4	11 01.9	10 51.6	10 91.4	71.5	103.7
Hops.....pound..	10.3	34.4	25.3	12.8	26.4	172.5	206.2
Ice.....ton..	4 03.5	2 86.2	2 97.5	3 40.0	2 99.3	73.5	88.0
Apples, dried.....pound..	4.8	6.6	7.1	4.0	6.0	63.8	150.0
India-rubber boots, &c.....pair..	1 67.3	1 49.1	1 95.3	1 56.1	2 00.8	61.8	128.6
Iron:							
Pig.....pound..	1.5	1.4	1.1	1.2	1.8	112.5	150.0
Bar.....do..	2.2	5.8	3.9	2.6	3.4	68.0	130.0
Boiler-plate.....do..	4.8	4.0	3.5	3.1	3.5	76.0	112.9
Railroad bars.....do..	1.6	1.3	1.6	1.5	2.1	58.3	140.0
Sheet, band, &c.....do..	4.2	3.7	5.4	3.1	5.2	96.3	167.7
Car-wheels.....piece..	8 95.7	5 84.6	9 96.8	8 78.7	7 92.5	39.7	90.1
Nails and spikes.....pound..	2.7	4.1	3.6	2.7	3.9	68.4	144.4
Steel:							
Ingots.....pound..	13.7	19.5	14.4	8.3	11.5	96.6	138.5
Railroad bars.....do..				2.1	2.1		100.0
Leather, sole and upper.....do..	19.6	27.2	22.1	20.3	23.2	81.7	114.2
Boots and shoes.....pairs..	1 06.4	1 26.7	1 17.7	1 22.2	1 16.6	76.7	95.4
Lime and cement.....barrel..	1 16.1	1 14.1	1 30.5	1 22.1	1 25.2	63.4	102.5
Rosin and turpentine.....do..	1 97.1	2 06.4	2 70.5	1 94.0	2 27.6	74.7	117.3
Tar and pitch.....do..	1 99.7	2 30.7	2 15.9	1 93.7	2 05.5	67.9	106.0
Oil-cake.....pound..	1.3	1.4	1.3	1.2	1.3	61.9	108.3
Mineral-oil, crude.....gallon..	7.6	7.7	7.7	8.4	6.8	31.6	80.9
Naphthas, benzine, &c.....do..	7.6	6.2	6.5	8.3	6.4	61.5	77.1
Illuminating oil.....do..	8.9	8.9	9.2	10.8	8.6	28.1	79.6
Lubricating oil.....do..	22.1	18.2	21.0	26.3	20.1		76.4
Lard-oil.....do..	44.7	58.6	54.0	52.8	54.1	39.3	102.4
Neat's-foot oil.....do..	70.5	99.7	79.2	92.5	77.4	59.7	83.6
Sperm-oil.....do..	82.8	1 00.6	1 02.2	88.5	1 01.0	63.5	114.1
Whale-oil.....do..	29.5	35.8	35.9	33.8	34.1	46.4	100.9
Cotton-seed oil.....do..	41.6	46.8	44.6	41.7	46.0		110.3
Linseed-oil.....do..	72.8	86.5	78.0	73.3	81.2	76.7	110.7
Gunpowder.....pound..	13.5	11.0	13.4	13.2	14.7	93.6	111.3

Average and comparative price of the principal domestic commodities, &c—Continued.

Commodities.	Average prices during month of—			Average price during year ended—		Comparative rates of 1880.	
	June, 1879.	December, 1879.	June, 1880.	June 30, 1879.	June 30, 1880.	Assuming prices of 1870 as 100.	Assuming prices of 1879 as 100.
Bacon and hams pound..	\$0 6.7	\$0 6.5	\$0 6.8	\$0 6.9	\$0 6.7	Per ct. 42.6	Per ct. 97.1
Fresh beef do.	9.3	9.8	8.6	9.0	8.7	-----	96.6
Salted beef do.	5.8	6.7	6.4	6.3	6.3	87.5	100.0
Butter do.	12.9	21.1	17.5	14.1	17.0	58.0	120.5
Cheese do.	7.8	11.7	11.4	8.8	9.5	62.0	107.9
Eggs dozen.	12.3	22.8	11.8	15.5	16.4	41.5	105.8
Fish:							
Dried cwt.	4 07.2	3 98.0	3 96.9	3 79.8	4 11.9	79.4	108.4
Pickled barrel	5 23.4	5 04.1	5 29.7	6 08.9	5 23.1	63.9	85.9
Lard pound.	6.6	8.7	7.4	6.9	7.4	44.8	108.9
Mutton, fresh do.	9.5	7.3	6.9	8.5	7.5	-----	88.2
Pork do.	5.8	6.7	6.3	5.6	6.1	44.8	108.9
Onions bushel.	90.3	97.6	1 43.9	92.7	90.7	54.1	97.8
Potatoes do.	97.3	69.5	76.5	87.1	74.9	108.5	85.9
Quicksilver pound.	33.4	40.7	38.3	39.1	38.0	93.6	97.1
Rags do.	1.0	4.1	1.4	2.0	1.8	20.2	90.0
Rice do.	3.6	8.1	7.0	4.8	7.2	122.0	150.0
Salt bushel.	58.2	20.8	41.0	31.1	29.8	74.3	95.8
Cotton-seed pound.	.9	.9	.8	.8	1.1	-----	137.5
Soap do.	4.8	4.7	4.4	5.0	4.7	58.7	90.4
Spermaceeti do.	23.1	22.4	20.1	24.0	22.7	69.0	94.5
Spirits:							
Grain gallon.	28.9	35.8	20.0	32.0	25.5	12.5	79.6
Molasses do.	29.9	32.8	33.1	32.1	30.9	41.3	96.2
Spirits of turpentine do.	25.4	39.7	27.4	27.0	30.0	71.7	111.1
Starch pound.	3.7	4.9	4.8	4.2	4.3	52.4	102.3
Sugar:							
Brown pound.	7.2	-----	6.8	7.2	6.3	56.2	87.5
Refined do.	8.0	9.1	9.2	8.5	9.0	72.0	105.8
Molasses gallon.	11.7	16.8	20.1	19.4	15.0	50.0	77.3
Tallow pound.	6.3	7.1	6.7	6.9	6.2	61.3	89.8
Tobacco, leaf do.	7.6	7.4	8.9	7.8	7.5	68.2	96.1
Varnish gallon.	1 96.9	1 55.9	2 61.8	1 57.4	2 11.6	133.3	134.4
Wax, bees pound.	21.7	23.7	33.1	27.1	25.2	62.6	92.9
Boards, planks M feet.	14 16.1	14 87.4	15 84.3	14 44.0	14 80.8	71.4	102.5
Timber, sawed cubic foot.	12.0	12.4	14.1	13.1	13.5	78.9	103.0
Wool, raw pound.	29.9	-----	16.7	29.0	37.5	104.4	129.3
Zinc:							
Ore cwt.	3 33.1	3 08.5	3 60.0	37.8	3 22.7	60.5	85.3
Plates, bars pound.	7.3	8.8	8.9	8.0	8.7	90.6	108.7
Average do.	-----	-----	-----	-----	-----	74.0	108.5

Statement by countries of the net imports of American silver coin for the fiscal years ended June 30, 1878, 1879, and 1880.

[From the reports of the Bureau of Statistics.]

Countries.	1878.	1879.	1880.
Argentine Republic.....		\$1,000	-----
Brazil.....	\$1,300	6,693	\$10,531
Central American States.....	77,063	224,310	122,489
China.....	65	1,400	90,991
Danish West Indies.....	475,170	343,339	98,600
France.....	1,200	231,325	844
French Possessions in Africa.....	500	150	-----
French Possessions, all other.....	-----	132	2,349
Germany.....	4,268	43,799	15,465
England.....	193,969	2,492,661	907,021
Gibraltar.....	-----	687	169
Nova Scotia, New Brunswick, and Prince Edward's Island.....	-----	-----	918
Quebec, Ontario, Manitoba, Rupert's Land, and the Northwest Territory.....	6,979	7,458	3,565
British Columbia.....	-----	-----	1,492

Statement by countries of the net imports of American silver coin, &c.—Continued.

Countries.	1878.	1879.	1880.
British West Indies and British Honduras.....	\$102, 887	\$80, 982	\$156, 741
British Possessions in Africa and adjacent islands.....	30, 564	20, 899	32, 798
British Possessions in Australasia.....		4	508
Hawaiian Islands.....	300		4, 161
Hayti.....	769, 255	785, 398	739, 328
Japan.....	785	956	10, 621
Mexico.....	475, 043	423, 990	306, 649
Dutch West Indies.....	29, 715	28, 005	23, 150
Dutch Guiana.....			
Peru.....			2, 530
Azore, Madeira, and Cape Verde Islands.....	35	8	8, 623
San Domingo.....	181, 305	222, 676	215, 423
Spain.....			806
Cuba.....	25, 674	192, 237	143, 748
Porto Rico.....	205, 848	392, 431	180, 985
United States of Colombia.....	182, 933	368, 270	184, 354
Venezuela.....		4, 341	20, 604
Total imports.....	2, 764, 858	5, 873, 151	*3, 291, 463
Total exports.....	†5, 394, 270	‡1, 526, 886	§659, 990
Net imports.....	||2, 629, 412	4, 346, 265	2, 631, 473

* Includes 783,062 trade-dollars.

§ Includes 43,383 trade-dollars.

† Includes 228,264 trade-dollars.

|| Excess of exports.

‡ Includes 288,137 trade-dollars.

CIRCULAR ESTIMATING AND PROCLAIMING, IN UNITED STATES MONEY OF ACCOUNT, THE VALUES OF THE STANDARD COINS IN CIRCULATION OF THE VARIOUS NATIONS OF THE WORLD.

1881.
Department No. 1.
Secretary's Office.

TREASURY DEPARTMENT,
BUREAU OF THE MINT,
Washington, D. C., January 1, 1881.

SIR: In pursuance of the provisions of Section 3564 of the Revised Statutes of the United States, I have estimated the values of the standard coins in circulation of the various nations of the world, and submit the same in the accompanying table.

Very respectfully,

HORATIO C. BURCHARD,
Director of the Mint.

Hon. JOHN SHERMAN,
Secretary of the Treasury.

Estimate of Values of Foreign Coins.

Country.	Monetary Unit.	Standard.	Value in U. S. Money.	Standard Coin.
Austria.....	Florin.....	Silver.....	.40, 7	
Belgium.....	Franc.....	Gold and silver.....	.19, 3	5, 10, and 20 francs.
Bolivia.....	Boliviano.....	Silver.....	.82, 3	Boliviano.
Brazil.....	Milreis of 1000 reis.....	Gold.....	.54, 6	
British Possessions in N. A.....	Dollar.....	Gold.....	\$1. 00	
Chili.....	Peso.....	Gold and silver.....	.91, 2	Condor, doubloon, and escudo.
Cuba.....	Peso.....	Gold and silver.....	.93, 2	1/8, 1/4, 1/2, and 1 doubloon.
Denmark.....	Crown.....	Gold.....	.26, 8	10 and 20 crowns.
Ecuador.....	Peso.....	Silver.....	.82, 3	Peso.
Egypt.....	Piaster.....	Gold.....	.04, 9	5, 10, 25, 50, and 100 piasters.
France.....	Franc.....	Gold and silver.....	.19, 3	5, 10, and 20 francs.
Great Britain.....	Pound sterling.....	Gold.....	4. 86, 6 1/2	1/2 sovereign and sovereign.
Greece.....	Drachma.....	Gold and silver.....	.19, 3	5, 10, 20, 50, and 100 drachmas.
German Empire.....	Mark.....	Gold.....	.23, 8	5, 10, and 20 marks.
India.....	Rupree of 16 annas.....	Silver.....	.39	
Italy.....	Lira.....	Gold and silver.....	.19, 3	5, 10, 20, 50, and 100 lire.
Japan.....	Yen.....	Silver.....	.88, 8	1, 2, 5, 10, and 20 yen, gold, and silver yen.
Liberia.....	Dollar.....	Gold.....	1. 00	

Estimate of Values of Foreign Coins, &c.—Continued.

Country.	Monetary Unit.	Standard.	Value in U. S. Money.	Standard Coin.
Mexico.....	Dollar.....	Silver.....	.89, 4	Peso or dollar, 5, 10, 25 and 50 centavo.
Netherlands.....	Florin.....	Gold and silver	.40, 2	
Norway.....	Crown.....	Gold.....	.26, 8	10 and 20 crowns.
Peru.....	Sol.....	Silver.....	.82, 3	Sol.
Portugal.....	Milreis of 1000 reis	Gold.....	1.08	2, 5, and 10 milreis.
Russia.....	Rouble of 100 copecks	Silver.....	.65, 8	$\frac{1}{2}$, $\frac{1}{4}$, and 1 rouble.
Sandwich Islands.....	Dollar.....	Gold.....	1.00	
Spain.....	Peseta of 100 centimes.	Gold and silver	.19, 3	5, 10, 20, 50, and 100 pesetas.
Sweden.....	Crown.....	Gold.....	.26, 8	10 and 20 crowns.
Switzerland.....	Franc.....	Gold and silver	.19, 3	5, 10, and 20 francs.
Tripoli.....	Mahbub of 20 piasters.	Silver.....	.74, 3	
Turkey.....	Piaster.....	Gold.....	.04, 4	25, 50, 100, 250, and 500 piasters.
United States of Colombia.....	Peso.....	Silver.....	.82, 3	Peso.
Venezuela.....	Bolivar.....	Gold and silver	.19, 3	5, 10, 20, 50, and 100 Bolivar.

TREASURY DEPARTMENT,
Washington, D. C., January 1, 1881.

The foregoing estimation, made by the Director of the Mint, of the value of the foreign coins above mentioned, I hereby proclaim to be the values of such coins expressed in the money of account of the United States, and to be taken in estimating the values of all foreign merchandise, made out in any of said currencies, imported on or after January 1, 1881.

JOHN SHERMAN,
Secretary of the Treasury.

DIVIDENDS AND ASSESSMENTS OF MINING COMPANIES.

The following, taken from the San Francisco Bulletin of December 30, 1880, gives a list and amounts of dividends paid in 1880 by the mining companies mentioned:

MINING DIVIDENDS PAID IN 1880.—Twenty-seven mines, either organized under the laws of California or owned by California capitalists, have paid dividends during the year now drawing to a close. Some of these have paid only one dividend, and one paid sixteen. Twelve of the mines are in California, eight in Nevada, four in Dakota, two in Arizona, and one in Utah. These are not the only mines that have paid dividends during the year in these States and Territories. Others have made their disbursements principally, if not solely, at New York, Boston, Philadelphia, and London. Some of those paying at San Francisco have also paid at New York and Boston. The Argenta paid its dividend last February. The Black Bear is largely owned in London; it has paid no dividend since last May, and has produced but little bullion in the past two months. The Bodie paid in January, February, and March, but not since. Two dividends were paid by the Consolidated Virginia in July and August. The Deadwood has paid eleven monthly dividends. It was then consolidated with the Golden Terra, which had paid three monthly dividends in September, October, and November. The consolidated organization is known as the Deadwood-Terra, and the first dividend on the double stock was paid at New York on the 27th of December. The Eureka Consolidated paid every month, but the February and March dividends were only 30 cents per share, while all the others were 50 cents per share. The Excelsior paid for the first nine months of the year. The Father de Smet is understood to have paid its dividends in the first seven months of the year at New York. The mine has recently resumed operations under the contract system. The Fresno Enterprise has no mill, the ore being worked in arrastras. The three dividends of 25 cents per share were paid in February, May, and December. The Grand Prize paid two dividends of 25 cents per share in August and September. The dividend of the Great Western Quicksilver was paid in December. The Homestake paid four extra dividends in the last four months of the year, and that is how it got sixteen in during the year. The dividend of the Indian Queen was paid in October, the first since August, 1879. The first three

dividends of the Idaho mine were \$4 per share; then came two of \$2 per share, then one of \$3 per share, and then six of \$5 per share. The Napa Consolidated Quicksilver paid no dividends in April, May, August, and November, but it did pay two in September. The mine was sold a few weeks ago to some Boston gentlemen, and has been reorganized under the laws of Massachusetts. The Natoma Water and Mining Company paid a quarterly dividend of \$2 per share in April and two of \$1.50 per share in July and October. The New York Hill paid in February, May, June, August, October, November, and December. In September there was a stock dividend of 35 per cent., consisting of shares bought in by the Company during the assessment period of the mine. The Northern Belle resumed dividends last May at the rate of 50 cents per share, and they have since been maintained. The North Belle Isle paid its first and only dividend of 15 cents per share last August. The dividend of the North Bloomfield Gravel was paid in November. The Ontario pays 50 cents per share at New York. It has been paying regularly since March, 1877. The Ophir dividend was paid last January. The Silver King renewed dividends in October at the rate of 25 cents per share. The Standard Consolidated paid 50 cents per share in January and February, and since then 75 cents per share, winding up the year with an extra one of the same amount. The dividend of the Watt Blue Gravel was paid in November, and is said to have been the proceeds of the sale of machinery. The Western began the payment of dividends in July, at the rate of 75 cents per share, and closed the year with an extra one of the same amount. Following is a detailed list of the dividends, to which we have thus made brief reference:

Mine and locality.	Num-ber.	Amount.
Argenta, Elko County, Nevada	1	\$20,000
Black Bear, Siskiyou County, California	5	43,500
Bodie Consolidated, Mono County, California	3	100,000
Consolidated Virginia, Storey County, Nevada	2	540,000
Deadwood, Lawrence County, Dakota	11	275,000
Deadwood-Terra, Lawrence County, Dakota	1	50,000
Eureka Consolidated, Eureka County, Nevada	12	280,000
Excelsior W. & M., Yuba County, California	9	225,000
Father de Smet, Lawrence County, Dakota	7	210,000
Fresno Enterprise, Fresno County, California	3	75,000
Grand Prize, Elko County, Nevada	2	50,000
Great Western Quick., Lake County, California	1	12,500
Golden Terra, Lawrence County, Dakota	3	75,000
Homestake, Lawrence County, Dakota	16	480,000
Indian Queen, Esmeralda County, Nevada	1	6,000
Idaho, Nevada County, California	12	127,100
Napa Consolidated Quick., Napa County, California	9	90,000
Natoma W. & M., Sacramento County, California	3	15,000
New York Hill, Nevada County, California	7	67,000
Northern Belle, Esmeralda County, Nevada	8	200,000
North Belle Isle, Elko County, Nevada	1	15,000
North Bloomfield, Nevada County, California	1	45,000
Ontario, Utah	12	600,000
Ophir, Storey County, Nevada	1	100,800
Silver King, Pinal County, Arizona	3	75,000
Standard Consolidated, Mono County, California	13	925,000
Watt Blue Gravel, Nevada County, California	1	7,000
Western Arizona	7	525,000
Totals	155	5,233,900

The locality of the mines distributing the above amount to stockholders during the past year is indicated in the following table:

	Mines.	Dividends.
California	12	\$1,732,100
Nevada	8	1,211,800
Dakota	4	1,090,000
Arizona	2	600,000
Utah	1	600,000
Totals	27	5,233,900
In 1879	19	6,678,000

During the year 1878 the mines disbursed \$18,234,700, but \$13,500,000 of that amount came from the California and Consolidated Virginia mines. This year the California does not appear in the dividend list, and the Consolidated Virginia paid only \$540,000.

In addition to the California dividends for the past year, mentioned above, it is known that two or three mines in Plumas County, organized under the laws of New York, have paid several dividends at New York; also two California gold mines, and one Nevada silver mine, operated with English capital, have paid dividends at London. The Starr-Grove Mine of Nevada, incorporated at New York, has paid two dividends of \$20,000 each at New York during the past two months. The Tombstone Mine in Arizona, near the Western, has paid nine dividends of \$50,000 each at Philadelphia this year. There have also been several Utah mines, besides Ontario, that have paid dividends at New York this year. The Christy Mine of Utah, owned in this city, and worked as a close corporation, has been producing from \$25,000 to \$30,000 per month right through the year, and we presume it has quietly divided considerable money among its few owners. We know of some private gold claims in California, owned in this city, that have done the same thing. The New York Record has a list of fourteen Colorado mines that have paid dividends during the past year at New York, but the aggregate amount for the year is not given. It is known that the mining camp at Leadville has produced from \$12,000,000 to \$14,000,000 in bullion this year, and stockholders have received at least 25 per cent. of the amount.

MINING ASSESSMENTS.

In connection with dividends declared, it may be interesting to compare assessments made in 1880 by mines in California, Nevada, Arizona, Utah, Dakota, and Idaho.

ASSESSMENTS.—The assessments levied last year were not paid with a very gratifying promptness in the case of those mines which were suspected of being more in the line of stock-jobbing operations than legitimate enterprises. The journal from which we took the above also publishes a list of the mining companies which levied assessments in 1880. The list is very long, and covers 249 claims in California, Nevada, Idaho, Utah, Arizona, Dakota, Lower California and Mexico. As it takes at least two months to go through all the legal forms of an assessment, it is impossible for any company to get in more than six during a single year. Only one company succeeded in doing this during the past year. Sierra Nevada leads in the aggregate amount, having called in \$1,0000,00, the largest amount collected by any single mine in three years.

There were 470 assessments, aggregating \$13,142,000. The list embraces 112 California mines located in 21 of the 52 counties of the State. Mono County gets \$1,918,900, and other counties nearly \$1,000,000, as follows:

CALIFORNIA.

Counties.	Num-ber.	Amount.
Mono	46	\$7, 918, 900
Placer	10	205, 200
Nevada	11	174, 500
Inyo	2	155, 000
Amador	6	83, 000
Sierra	3	75, 000
Butte	6	57, 000
Mariposa	1	45, 000
Calaveras	6	31, 000
Yuba	2	28, 000
San Bernardino	1	27, 500
El Dorado	5	25, 900
Tuolumne	3	23, 000
Plumas	1	13, 500
Del Norte	3	10, 000
Shasta	2	9, 000
Trinity	2	5, 600
Tulare	1	5, 500
Fresno	1	3, 000
Tehama	1	3, 000
Alpine	1	2, 000
Totals	112	2, 900, 600

The following record of the comparative assessments and dividends of mines of the Comstock lode will show that while assessments have

not been lessened, dividends have in the last four years been reduced to a minimum:

THE FOUR BARREN YEARS.—Those who have watched the development of the Comstock lode for the past twenty years must have noticed barren periods, when there was but comparatively little to divide up in the way of dividends to stockholders. We are now passing through one of these streaks of porphyry. A year has passed, and only two Comstock mines have remembered stockholders in a pleasing way. There have been just three dividends. One of these was paid last January, which is so long ago that most people have forgotten all about it. The other two were paid last July and August. The total amount of the three dividends is \$640,800. A single mine on the Comstock has drawn \$1,000,000 from stockholders during the past year in assessments, and twenty others have collected from \$10,000 to \$600,000 in the same way. The Comstock lode for the past year has done the poorest for stockholders in a long time. Indeed, for four years only three Comstock mines have paid dividends. Meanwhile the assessments on the leading mines there have been large. The record compares annually as follows:

	Assessments.	Dividends.
1877	\$6,306,200	\$21,600,000
1878	7,002,000	13,500,000
1879	7,259,600	3,070,800
1880	6,792,800	640,800
Totals	27,360,600	38,811,600

The above are not all the assessments levied on the Comstock lode. They embrace only the collections of twenty-nine of the leading claims, extending from Utah on the north to Benton on the south. This belt takes in about two miles of territory, and nearly all the mines that have made any history for themselves. Only two mines in this whole list have got along without aid from stockholders for the past four years. These two mines are the California and Consolidated Virginia, which have paid \$38,610,000 of all the dividends disbursed by the Comstock lode in the past four years, the other \$201,600 being paid by the Ophir. Following is a transcript from the ledger balances of the 29 principal Comstock mines for the past four years, as kept at this office:

	Dividends.	Assessments.
Utah		\$680,000
Sierra Nevada		2,750,000
Union Consolidated		700,000
Mexican		1,179,400
Ophir	\$201,600	957,600
California	22,680,000	
Consolidated Virginia	15,930,000	
Best & Belcher		907,200
Gould & Curry		980,000
Savage		1,848,000
Hale & Norcross		1,204,000
Chollar		728,000
Potosi		224,000
Julia Consolidated		1,160,500
Bullion		1,550,000
Exchequer		300,000
Alpha Consolidated		180,000
Consolidated Imperial		1,100,000
Confidence		12,500
Yellow Jacket		2,040,000
Kentuck		39,000
Crown Point		1,300,000
Belcher		1,637,000
Overman		1,054,800
Caledonia		750,000
Justice		1,680,000
Silver Hill		901,800
Alta		1,242,000
Benton		253,800
Totals	38,811,600	27,360,600

THE ASSESSMENT ROLL OF 1880.—According to a table made up by a San Francisco exchange, the following is the monthly and aggregate statement of assessments, delinquent during the year 1880, upon the mines of Nevada, California, Arizona, and Utah:

	Num-ber.	Amount.
January	49	\$1,218,400
February	37	1,062,800
March	36	1,130,300
April	47	1,366,500
May	39	1,139,900
June	35	1,079,600
July	38	961,000
August	38	1,233,200
September	51	1,094,600
October	33	893,100
November	36	859,400
December	32	886,600
Totals	461	12,925,400

It is hardly necessary to say that about 80 per cent. of this amount was levied upon Nevada mines, chiefly of the Comstock lode. For 1879, we learn from the same source that the assessments footed up some \$15,000,000.

DIVIDENDS FOR THE HALF YEAR.—For the half year ended June 30, 1880, the mining companies paying dividends at San Francisco, were as follows:

	Number of dividend.	Per share.	Amount.
Argenta Mining Company, Nevada	1	\$0 20	\$20,000
Black Bear Quartz Gold Mining Company, California	6	1 75	52,500
Bodie Consolidated Gold Mining Company, California	3	1 25	125,000
Deadwood Mining Company Dakota	6	1 50	150,000
Excelsior Washing and Mining Company, California	6	1 50	150,000
Eureka Consolidated Silver Mining Company, Nevada	6	2 80	144,000
Father De Smet Consolidated Gold Mining Company, Dakota	6	1 80	180,000
Fresno Enterprise Mining Company, California	3	75	75,000
Great Western Gold Mining Company, California	1	25	12,500
Homestake Mining Company, Dakota	6	1 80	180,000
Idaho Gold Mining Company, California	6	10 00	31,000
New York Hill Gold Mining Company, California	2	50	25,000
Northern Belle Silver Mining Company, Nevada	3	1 00	50,000
Napa Consolidated Mining Company, California	1	10	10,000
Ontario Mining Company, Utah	6	3 00	300,000
Ophir Silver Mining Company, Nevada	1	1 00	100,000
Standard Consolidated Mining Company, California	6	4 00	400,000
Total			2,000,000

In addition to the foregoing, the Cherokee Flat Blue Gravel Mining Company paid one dividend (in March) of \$4.25 per share, and the Watoma Water and Mining Company, one of \$2 per share in April, but are not included above, as we are unable to give the aggregate amount in either case. Both are California properties.

The companies paying dividends here, in New York, for the same period, were the following:

	Number of dividend.	Per share.	Amount.
Amie Consolidated Mining Company, Colorado	2	\$0 20	\$10,000
Atlantic Consolidated Mining Company, Michigan	1	1 00	40,000
Bassick Mining Company, Colorado	1	25	25,000
Barbee & Walker Mining Company, Utah	1	10	10,000
Boltail Consolidated Mining Company, Utah	1	10	22,515
Breece Mining Company, Colorado	2	05	20,000
Caribou Mining Company, Colorado	2	20	20,000
Chrysolite Silver Mining Company, Colorado	4	3 50	700,000

	Number of dividend.	Per share.	Amount.
Climax Mining Company, Colorado.....	3	\$0 50	\$100,000
Central Copper Mining Company, Michigan.....	1	5 00	100,000
Empire Gold Mining Company, California.....	5	36	72,000
Freeland Mining Company, Colorado.....	1	25	50,000
Great Eastern Gold Mining Company, Dakota.....	1	02	6,000
Green Mountain Gold Mining Company, California.....	6	35	43,750
Horn Silver Mining Company, Utah.....	1	25	100,000
La Plata Mining and Smelting Company, Colorado.....	6	50	100,000
Leadville Consolidated Mining Company, Colorado.....	1	15	30,000
Little Chief Mining Company, Colorado.....	5	2 50	500,000
Little Pittsburg Silver Mining Company, Colorado.....	3	1 50	300,000
Robinson Consolidated Mining Company, Colorado.....	1	75	75,000
Stormont Mining Company, Utah.....	1	30	45,000
Tombstone Mining and Milling Company, Arizona.....	2	20	100,000
Total.....			2,369,265

WHERE THE SPECIE MONEY IS.—As a part of the monetary history of the times, we publish below the amount of silver and gold coin and bullion in the leading banks of Europe about the middle of November, 1880:

Bank of France.....	\$360,715,000
Bank of England.....	\$132,960,000
Imperial Bank of Germany.....	134,525,000
Netherlands Bank.....	58,150,000
National Bank of Belgium.....	18,390,000
	344,025,000
Austro-Hungarian Bank.....	82,490,000
Bank of Russia.....	109,705,000
Bank of Spain.....	41,495,000
	233,690,000
Italian Bank of Emission.....	27,125,000
National Bank of Italy, &c.....	16,745,000
	43,870,000
Swiss concordat banks.....	8,150,000

Total gold and silver in eleven European national banks..... 990,450,000

Nevada is the great absorbent of assessment money, the Comstock lode, which runs through Storey County, taking the lion's share. That State has made the poorest returns this year for the amount of money expended of any of the mining fields under consideration. Following is the apportionment:

NEVADA.

Counties.	Num- ber.	Amount.
Storey.....	61	\$7,789,900
Esmeralda.....	13	552,500
Eureka.....	6	237,500
Elko.....	9	235,000
Lincoln.....	3	190,000
White Pine.....	4	166,500
Nye.....	4	132,500
Ormsby.....	1	25,000
Humboldt.....	1	10,000
Lander.....	1	6,000
Lyon.....	2	37,000
Total.....	105	9,381,900

Arizona has developed one dividend mine this year that has given back more than the 18 mines in the annexed list have collected:

ARIZONA.

Counties.	Num-ber.	Amount.
Yavapai.....	4	\$190,000
Pinal.....	8	99,000
Mohave.....	2	65,000
Yuma.....	2	13,000
Maricopa.....	2	11,000
Total.....	18	378,000

Utah has been very moderate in its demands. Its importance as a mining field was never so well understood as it has been during the past year. Here is the list of assessments:

UTAH.

Counties.	Num-ber.	Amount.
Washington.....	1	\$21,000
Juab.....	2	15,000
Little Cottonwood.....	1	8,000
Total.....	4	44,000

Most of the money for Dakota was collected by the Caledonia Mining Company. The mine is said to show good prospects of returning the outlay. There are three dividend-paying mines in Dakota. Idaho has made only one call for aid this year through the Florida Company. There are two mines in Lower California and two in Mexico that have levied assessments in this city during the year. The apportionment of assessment money for these miscellaneous sources for the past year has been as follows:

MISCELLANEOUS.

	Ore.	Amount.
Dakota, Lawrence County.....	5	\$345,000
Idaho, Owyhee County.....	1	10,000
Lower California.....	2	17,500
Mexico.....	2	65,000
Total.....	10	437,500

The grand total of mines assessed and money collected compares as follows:

	Num-ber.	Amount.
1880.....	470	\$13,142,000
1879.....	514	14,827,700
1878.....	422	13,951,500

Of the assessments levied this year, not over 50 per cent. was paid in. In many cases the collections were not sufficient to pay the cost of advertising the assessment and delinquent notices.

An inspection of these figures shows the fallacy of the opinion often entertained that in the production of gold and silver the total amount yielded by the mines is so much clear gain to be added to the wealth of the country. The development of the mineral resources of the nation

doubtless increases its prosperity, stimulates enterprise, and is beneficial in diversifying its industry, but its remunerative mines only are sources of wealth to the nation as well as to individual owners. It is only the net return above expenditure that adds wealth. But for the Bonanza mines, which have made colossal fortunes for a few fortunate owners, supplemented by the steady production of a few other mines less conspicuous, the balance-sheets in mining operations would show a net loss rather than a gain. But, however, that mining enterprises on the Pacific coast have, in the aggregate, resulted in a large gain to the wealth of the country is evidenced by the average *per capita* wealth of California, compared with other new but older States.

The dividends of the California and Consolidated Virginia mines for the three years ending May 1, 1880, after adding the two dividends from the Ophir mine, will be—

	California.	Consolidated Virginia.	Total.
May 1, 1877-'78	\$12,960,000	\$12,960,000	\$25,920,000
May 1, 1878-'79	3,320,000	1,350,000	4,670,000
May 1, 1879-'80	1,080,000	1,080,000	2,160,000
Total	17,360,000	15,390,000	32,750,000
Ophir dividends in December and January			201,600
Dividends for three years			32,951,600
Assessments for three years			21,538,740
Balance to credit of stockholders			11,412,860

Still the result shows that mining on the Comstock for the three years, dark as that period has been, is not without profit, viewing the work in the aggregate. There has probably been \$50,000,000 added to the bullion supply of the world by the Comstock mines in this interval, of which \$33,000,000 has gone directly into the pockets of stockholders, and two-thirds of the latter amount has been retained.

[From the Engineering and Mining Journal.]
(Abbreviations: G., gold; S., silver; L., lead; C., copper.)
General mining stocks.

DIVIDEND-PAYING MINES.

Name of company.	Location.	Fluct on vein.	Capital stock.	Shares.		Assessments.		Dividends.	
				Number.	Par value.	Total levied to date.	Date and amount per share of last.	Total paid to date.	Last dividend.
Amie Consolidated (S., L.)	Colorado		\$5,000,000	500,000	\$10	*	Nov., 1880	\$905,000	May, 1880
Argentina (S.)	Nevada	1,500	10,000,000	100,000	100	\$110,000		40,000	Feb., 1880
Barbee & Walker	Utah		1,000,000	100,000	10	*		60,000	Nov., 1880
Bassick (G., S.)	Colorado		10,000,000	100,000	100	*		25,000	Feb., 1880
Belle Isle (S.)	Nevada	1,500	10,000,000	100,000	100	30,000	Feb., 1880	300,000	Dec., 1879
Belcher (G., S.)	Colorado	1,040	20,400,000	104,000	100	2,042,800	Aug., 1880	15,397,200	April, 1879
do	Colorado	2,500	1,136,000	227,226	5			125,000	Sept., 1880
Boltail (G.)	California		10,000,000	100,000	100	75,000	May, 1879	1,200,000	Mar., 1880
California (G., S.)	Nevada	600	54,000,000	540,000	100	*		31,320,000	Dec., 1879
Caribou Consolidated (G.)	Colorado	1,400	1,000,000	100,000	10	*		1,100,000	Mar., 1880
Chrysolite (S., L.)	do		10,000,000	200,000	50	*		180,000	April, 1880
Climax (S., L.)	Nevada	710	2,000,000	200,000	10	*	June, 1879	42,930,000	Aug., 1880
Consolidated Virginia (G., S.)	North Carolina		54,000,000	540,000	100	474,600		15,000,000	Nov., 1880
Copper Knob	Nevada	600	10,000,000	100,000	100	2,473,370	Oct., 1880	11,588,000	Jan., 1879
Crown Point (G., S.)	Dakota								Dec., 1880
Deadwood-Terra (G.)	Colorado		3,000,000	200,000	25		May, 1876	4,505,000	Dec., 1880
Dunkin	Nevada		5,000,000	50,000	100	100,000		830,000	Sept., 1880
Eureka Consolidated (G., S., L.)	California	1525	10,000,000	100,000	100	*		240,000	July, 1880
Excelsior Water and Mining Company	Dakota		10,000,000	100,000	100	*		8,000	May, 1879
Father de Smet (G.)	Georgia		300,000	200,000	1	*		50,000	May, 1880
Fendley (G.)	Colorado		5,000,000	200,000	25	*		45,000	May, 1880
Freeland	California		150,000	1,500,000	10			3,826,800	Oct., 1879
Gold Strips	Nevada	612	10,800,000	108,000	100	3,206,000	Aug., 1880	4,450,000	Sept., 1880
Gould & Curry (G., S.)	do	1,500	10,000,000	100,000	100	220,000	Dec., 1879	16,000	July, 1880
Grand Prize (S.)	Dakota	1,200	10,000,000	300,000	1	*		112,500	Dec., 1880
Great Eastern (G.)	California	4,350	1,250,000	125,000	10	*		1,538,000	April, 1871
Green Mountain (G.)	Nevada		11,200,000	112,000	100	3,530,000	Dec., 1880	846,000	Dec., 1880
Hale & Norcross (G., S.)	Colorado		10,000,000	100,000	100	200,000	April, 1878	200,000	Jan., 1880
Hibernia	Dakota		10,000,000	100,000	25	*		210,000	Dec., 1878
Homeslake (G.)	Utah		1,000,000	200,000	5				
Horn-silver (S., L.)	Colorado								
Huichil (G., S.)	Colorado								

† Acres.

* Non-assessable.

General mining stocks—Continued.

DIVIDEND-PAYING MINES—Continued.

Name of company.	Location.	Feet on vein.	Capital stock.		Shares.		Assessments.		Dividends.	
					Number.	Par value.	Total levied to date.	Date and amount per share of last.	Total paid to date.	Last dividend.
Independence (S.)	Nevada	1,500	\$10,000,000		100,000	\$100	\$135,000	April, 1880	\$225,000	Sept., 1879
Kentuck (G., S.)	do	95	3,000,000		30,000	100	315,000	Aug., 1880	1,252,000	Mar., 1870
La Plata (S.)	Colorado	.....	2,000,000		200,000	10	*	.....	255,000	Nov., 1880
Leadville (S.)	do	.....	2,000,000		200,000	10	*	.....	150,000	Nov., 1880
Leeds (S.)	Utah	3,000	6,000,000		60,000	100	27,000	Nov., 1880	78,000	Oct., 1878
Leopard (L., G., S.)	Nevada	1,500	5,000,000		50,000	100	347,500	April, 1880	162,500	Dec., 1876
Little Chief (S., L.)	Colorado	.....	10,000,000		200,000	50	*	.....	700,000	Aug., 1880
Little Pittsburgh (S., L.)	do	130	20,000,000		200,000	100	*	.....	1,350,000	Mar., 1880
Martin White (S.)	Nevada	22,900	10,000,000		100,000	100	750,000	Sept., 1880	165,000	Dec., 1880
Moose (S.)	Colorado	39,000	2,000,000		200,000	10	*	.....	50	Dec., 1878
Napa Consolidated (G.)	California	.....	10,000,000		100,000	100	*	.....	550,000	Mar., 1880
New York and Colorado (G.)	Colorado	.....	1,000,000		50,000	20	*	.....	140,000	Nov., 1880
Northern Belle (S.)	Nevada	1,600	5,000,000		50,000	100	.....	.....	25,000	July, 1879
North Belle Isle	do	.....	.....		.....	.....	.....	.....	1,700,000	Dec., 1880
Ontario (S.)	Utah	3,000	10,000,000		100,000	100	.....	.....	3,100,000	Sept., 1880
Ophir (G., S.)	Nevada	3,675	10,080,000		100,800	100	2,947,000	Aug., 1880	1,603,200	Dec., 1880
Ore Knob (C.)	North Carolina	11,600	1,500,000		150,000	10	*	.....	173,300	Jan., 1880
Plumas (G.)	California	.....	1,000,000		100,000	10	715,000	.....	151,000	Sept., 1880
Raymond & Ely (G., S.)	Nevada	5,000	12,000,000		120,000	100	955,000	Aug., 1880	3,075,000	July, 1879
Richmond (S.)	do	.....	1,350,000		54,000	25	600,000	.....	2,315,830	Sept., 1873
Rising Sun	California	.....	750,000		150,000	5	*	.....	175,000	May, 1880
Robinson Consolidated	Colorado	.....	10,000,000		200,000	50	*	.....	.....	Nov., 1880
Silver Islet Consolidated	Michigan	25	1,000,000		400,000	25	*	.....	.....	Sept., 1880
Stormont (S.)	Utah	.....	150,000		150,000	1	*	.....	135,000	Nov., 1880
Savage (G., S.)	Nevada	800	11,200,000		112,000	100	5,076,000	Oct., 1880	4,450,000	June, 1869
Sierra Nevada (G., S.)	do	3,650	10,000,000		100,000	100	4,350,000	Nov., 1880	102,000	Jan., 1871
Silver King (S.)	Arizona	1,500	10,000,000		100,000	100	.....	.....	500,000	Dec., 1880
Spring Valley	California	.....	200,000		200,000	100	.....	.....	50,000	Jan., 1881
Standard (S.)	do	.....	10,000,000		100,000	100	50,000	July, 1878	2,325,000	Dec., 1880
Tombsstone (S.)	Arizona	.....	12,500,000		500,000	25	*	.....	2,500,000	Jan., 1881
Yellow Jacket (G., S.)	Nevada	1,200	12,000,000		120,000	100	3,978,000	Oct., 1880	2,184,000	Aug., 1871

NON-DIVIDEND-PAYING MINES.

			600	10,800,000	108,000	100	1,203,000	Aug., 1880	50		
Alta	Nevada						*				
Alta-Montana	Montana			5,000,000	500,000	10	*				
Alice	do						*				
American Flag (G.)	Colorado		5,300	1,250,000	125,000	10	*				
Auburn and Rock Creek	do			5,000,000		10	*				
Battle Creek	Dakota			200,000	200,000	25	*				
Bechtel Consolidated (G.)	California			10,000,000	100,000	100	162,750	Dec., 1880	15		
Belvidere (G.)	do		1,500		60,000		147,000	Dec., 1880	50		
Best & Belcher (G., S.)	Nevada		545	10,050,000	100,800	100	992,990	Dec., 1880	50		
Bald Mountain	Colorado			10,000,000	100,000	10	*				
Bonanza Chief	Montana			1,000,000	1,000,000	1	*				
Bull-Domingo	Colorado			10,000,000	200,000	50	*				
Boulder Consolidated	California										
Boston Consolidated	do										
Buckeye	Colorado			2,000,000	400,000	5	*				
Bullion (G., S.)	Nevada		943	10,000,000	100,000	100	352,000	Dec., 1880	1 00		
Bulwer (G.)	California			10,000,000	100,000	100	30,000	Dec., 1877	50		
Bye and Bye	Arizona			1,000,000	100,000	10	*				
Calaveras (G.)	California		†2,600	500,000	500,000	1	*				
Caladonia	do										
Cal. B. H. (G.)	Dakota			10,000,000	100,000	100		Oct., 1880	50		
Central Arizona (S.)	Arizona			10,000,000	100,000	100					
Cherokee (G.)	California			150,000	1,500,000	10					
Columbia Consolidated (G., S.)	Nevada			5,000,000	100,000	50					
Cosette	New Mexico			100,000	10,000	10					
Consolidated Imperial (G., S.)	Nevada		468	50,000,000	500,000	100	1,275,000	July, 1880	10		
Consolidated Pacific (G.)	California		1,400	600,000	60,000	100	90,000	July, 1880	50		
Crowell	do			500,000	500,000	1	*				
Dahlonega (G.)	Georgia			250,000	250,000	1	*				
Dunderberg	Colorado			1,500,000	150,000	10	*				
Durango	Dakota			500,000	500,000	1	*				
Girard	Arizona										
Gold Placer (G.)	Colorado			5,000,000	200,000	25	*				
Goodshaw (G.)	California			10,000,000	100,000	100	130,000	Oct., 1880	25		
Glyn Dale	do							July, 1880	25		
Granville (G.)	North Carolina		†1,231	300,000	300,000	1	*				
Harshaw	Arizona			10,000,000	100,000	100					
Iron Silver	Colorado			10,000,000	500,000	20	*				
Justice (G., S.)	Nevada		2,000	10,500,000	103,000	100	3,206,500	Sept., 1880	50		
Kossuth	do		2,700	10,700,000	103,000	100	421,200	Aug., 1877	15		
Lacrosse	do		3,900	1,000,000	100,000	10	*				
Leviathan	Colorado		2,000	10,000,000	100,000	100		July, 1880	15		
Lucerne	Colorado		4,200	5,000,000	500,000	10	*				
Malachite	Nevada										
Mariposa, preferred	California		†14,387	5,000,000	50,000	100	1,425,000	June, 1877	1 00		
Mariposa, common	do			10,000,000	100,000	100	1,425,000	June, 1878	1 00		
May Belle (G.)	do		1,500	10,000,000	100,000	100	56,000	Dec., 1880	10		

† Acres.

* Non-assessable.

General mining stocks—Continued.
NON-DIVIDEND-PAYING MINES—Continued.

Name of company.	Location.	Feet on vein.	Capital stock.	Shares.		Assessments.		Dividends.	
				Number.	Par value.	Total levied to date.	Date and amount per share of last.	Total paid to date.	Last dividend.
Mayflower	Colorado		\$1,000,000	100,000	\$100	*			
Mineral Creek	Arizona		2,000,000	200,000	10	*			
Miner Boy	Colorado			60,000	100	\$103,000	Oct., 1880	\$0 65	
McClinton (G.)	California	1,000	10,080,000	100,800	100	1,487,800	Sept., 1880	1 00	
Mexican (G., S.)	Nevada	600	5,000,000	50,000	100	250,000	Oct., 1880	50	
Mono (G.)	California	750	5,000,000	100,000	100	175,000	Dec., 1880	20	
Navajo	Nevada	500	10,000,000						
North Standard (G.)	California								
Overman (G., S.)	Nevada	1,200	3,840,000	38,400	100	3,538,680	Dec., 1880	50	
Quicksilver, preferred	California	78,500	4,291,300	42,913	100	*			
Quicksilver, common	do		5,708,700	57,087	100	*			
Rappahannock (G.)	Virginia	†345	250,000	250,000	1	*			
Red Elephant	Colorado		5,000,000	500,000	10	*			
Silver Cliff (S.)	do		10,000,000	200,000	50	*			
Silver Nugget	Arizona		2,000,000	200,000	10	*			
South Butte (G.)	California	1,500	10,000,000	100,000	100	85,000	Nov., 1880	25	
South Hite Gold Mining Company	do	1,500	10,000,000	100,000	100	145,000	April, 1880	50	
Sutro Tunnel	do		2,500,000	100,000	25	*			
Tip Top	Nevada		20,000,000	200,000	10	*			
Tioga	Arizona	1,500	10,000,000	100,000	100	120,000	Mar., 1880		
Tuscarora (S.)	California	1,500	10,000,000	100,000	100	225,000	Nov., 1880	15	
Unadilla	Nevada		10,000,000	100,000	100	80,000	Oct., 1880	15	
Union Consolidated (G., S.)	Colorado		500,000	500,000	1	*			
Vandewater	Nevada	800	10,000,000	100,000	100	900,000	Nov., 1880	1 00	
Willshire	do		2,000,000	200,000	10	*			
	California		50,000	50,000	1				

† Acres.

* Non-assessable.

MONETARY STATISTICS OF FOREIGN COUNTRIES.

(From Report of the Director of the Mint for 1880.)

The effort to gather and present in convenient form for reference statistics of the production, coinage, and use of the precious metals in other countries, and the amount and character of their circulation, was continued with advantage during the year, and much valuable information has been obtained in reply to the inquiries transmitted by the Secretary of State at your request.

Our ministers and consuls abroad have displayed commendable zeal and activity in securing the desired statistics, and grateful acknowledgments are due to the officials of foreign governments, from whom replies have been received, for their prompt and satisfactory responses.

The information in relation to coinage, circulation, production, and specie reserves has been collated from these dispatches and other sources into tables, which will be found in the appendix.

A brief review of some of the most useful facts contained in the papers received is herewith presented:

Great Britain.—From the papers received it would appear the net specie exports of Great Britain were, during the year 1879, gold £2,937,000, silver £500,000. Mr. Freemantle estimates the specie circulation at the close of 1879 to have been as follows:

Gold coin, £122,474,000 =	\$596, 019, 721
Silver coin, £19,017, 000 =	92, 546, 231
A total of	688, 565, 952

which shows the circulation to be about \$23,500,000 less than my estimation for last year. It can hardly be said that there is any stock of silver bullion in the United Kingdom, the imports and exports being about equal. The coinage of gold at the royal mint was very small, being only £35,050, while the total value of silver coined was £549,054, and the amount of worn silver coin withdrawn from circulation during the year was £495,944. The report of the deputy master of the mint shows that the average price at which silver (British standard) was purchased during the year was 52 $\frac{7}{8}$ d. per ounce, the seigniorage accruing to the state being at the rate of 13 $\frac{1}{8}$ d. per ounce, or 24 $\frac{1}{8}$ per cent. The rate of seigniorage was nearly 7 per cent. less than during the previous year.

Australia.—The dispatches of O. M. Spencer, consul-general at Melbourne, contain seriatim replies to the circular of the Secretary relative to monetary statistics, and also inclose interesting papers from J. W. Smith, consular agent at Port Adelaide, and from V. Delves Broughton, deputy master of Melbourne branch mint, the first giving the history of the discovery of gold in 1851 and the exodus to South Australia in consequence, and the business crises occasioned thereby, and the second an instructive account of the discovery of the "chlorine process" for separating and refining gold. Both these papers will be found well worthy of perusal.

The production of gold in the province of Victoria amounted in 1879 to 758,947 ounces, valued at \$15,000,000, and the average annual production for the past ten years has been 1,063,148 ounces, valued at \$20,000,000. No silver is mined, but a small quantity is parted from gold. The coinage at the Melbourne mint during 1879 was the largest since its establishment, amounting to £2,740,000, all in sovereigns.

India.—Information in regard to the paper and specie circulation of India has of late years been sought for with more than usual eagerness on account of the important relation sustained by that country to the future of silver. Two papers have been received from Consul-General Litchfield, one transmitting information from Hon. R. B. Chapman, secretary of the government of India, together with tabular statements showing the imports, exports, and coinage of gold and silver in India, and the paper money issued by the Bengal, Madras, and Bombay presidencies from 1835 to 1879, inclusive. These tables are especially valuable as showing the immense quantity of silver absorbed by India in the last half century. The net imports of silver during 1879 were £3,970,694. The other paper contains a *résumé* of the mint laws and regulations of India.

No banks or other private corporations are allowed to issue paper money—the only notes in circulation being those of the State, for which the government holds a reserve of specie and bonds equal to the entire paper issue.

These government notes are received everywhere at their nominal value, and amount at present to \$48,060,176.

Silver is the standard of value of the country; gold is not rated a legal tender, but is received in payment of debts. The coins of other countries, or of native Indian States, do not circulate.

Canada.—The response of the deputy minister of finance of the Dominion of Canada, with documents, transmitted through Hon. J. Q. Smith, consul-general of the United States, show the following facts:

There is no mint in Canada, its coin being supplied from the home government. The system of paper money of Canada is similar to that of the United States, consisting of Dominion notes to the amount of \$12,000,000 and bank notes to the amount of \$20,000,000. The issue of Dominion notes is limited to \$20,000,000, for which specie and government securities are held.

Germany.—Valuable documents have been received from Germany, together with a communication from Hon. Andrew D. White, United States minister at Berlin, commenting upon the efforts being made for the remonetization of silver by Germany, which it would appear is under consideration. The principal item of information in this paper is that the annual production of the mines (silver) of Freiberg has fallen off about \$250,000 since the demonetization of silver.

The quantity of silver remaining in Germany to be sold amounted at the close of 1879 to 3,932,353 fine pounds (63,212,574 fine ounces), which at the average price of former sales (79.824 marks per fine pound) would realize 313,896,000 marks=\$74,707,248. The loss on the sale of this silver at the rates previously realized would amount to about \$17,000,000 (an average of 21 per cent).

France.—The documents received from Mr. Noyes, United States minister at Paris, show the coinage of France from 1795 to 1879 to have been—

	Francs.
Gold.....	8,716,438,200
Silver	5,511,952,863

The amount of specie imported in 1879 was 339,170,000 francs, and exported during the same year 424,543,000 francs. No coinage of silver was executed at the Paris mint in 1879. The gold coinage consisted of 3,860,100 francs in 100-franc and 24,610,540 francs in 20-franc pieces; in all, 28,470,640 francs, besides the coinage of a million francs in 20-franc pieces, for the principality of Servia.

The new agreement of the Latin Monetary Union went into effect on the first of the present year. A law was passed July 31, 1879, by the French legislature abolishing the contract system of coinage and creating a bureau for the management of the mint, and placing the coinage, as in this country and Great Britain, under the control of a responsible officer—called there, also, a director—and subject to the direction of the minister of finance.

In my last report (page 28), in stating the metallic circulation of France, I said: "While doubting the accuracy of the exhibit, in default of better data the estimates given are accepted." Among the documents since received are the reports made to their respective governments by the delegates to the monetary convention of the states of the Latin Union held November 5, 1878, from which valuable information has been obtained in revising the table of circulation found in this report:

The specie circulation of France is given as—

Gold.....	\$927,000,000
Silver (full legal tender).....	540,786,000
Silver (limited tender).....	57,900,000
Total.....	1,525,686,000

The statement of the gold circulation is based upon the estimate for 1878 of M. Folville, adopted by Dr. Soetbeer, 5,000 million francs, from which is deducted the loss by export and use in the arts for 1879, 203,000,000 francs.

The five-franc silver circulation is stated at a mean of three estimates made by the following distinguished statisticians, after adding subsequent importation and subtracting exports and consumption in the arts, viz:

1st. Report made 1878 by a committee of French Chamber of Deputies through M. Guyot, five-franc pieces, close of 1877, 2,530,000,000 francs.

2d. Herr de Folville (quoted by Dr. Soetbeer) close of 1872, 2,880,000,000 francs.

3d. Ernest Seyd's estimate in 1870, with subsequent importation given in tables (less fractional silver and payment to Germany, 539,000,000 francs), close of 1879, 2,747,000,000 francs.

The circulation of five-franc pieces at the close of 1879 would be, taking the mean of these estimates, 2,802,000,000 francs.

Austria.—Minister Kasson transmits, under date of July 6, 1880, interesting statistics in relation to the coinage laws of Servia and a communication from the Austro-Hungarian minister of finance, giving the laws regulating the coinage of money in Austria and tables of coinage and circulation. Silver is the standard of value in Austria and Hungary. Gold as well as silver coins are struck at the mints at Vienna and Kremnitz, but the principal circulating medium is paper money, the total issue of which amounted on the 31st of December, 1879, to \$259,682,597, being about equally divided between state and bank notes.

Since the suspension of specie payments in 1848, private debts and internal taxes have been paid in bank and government notes. Customs dues are paid in gold and silver. The value of the paper money has enhanced as the value of silver became depreciated, and since the 1st of January last the paper and silver florin have been of equal value.

A dispatch is printed in the appendix from Mr. J. F. Delaplaine, of the legation at Vienna, to the effect that intelligence has been received there that the principality of Bulgaria intends coining money, the mone-

tary unit of which will be the franc, and the total silver coinage has been fixed at 9,500,000 francs. The largest gold piece will be the "Alexander," of the value of 20 francs. The amount of the gold coinage has not been fixed. The coinage will be executed at Paris.

Netherlands.—The papers forwarded by our minister at The Hague show that no coinage was executed at the mint of Holland during the year 1879. The silver standard prevailed in the Netherlands up to 1875, when the double standard was adopted. The metallic money in circulation is principally silver, which is coined only on government account, and the coinage is at present restricted. The paper circulation consists of bank notes, issued by the Bank of Netherlands, and is not a legal tender, but is received by the government and preferred by individuals, and is secured by a deposit of government interest-bearing bonds.

The Scandinavian countries—Denmark, Norway, and Sweden.—The documents and communications received through our ministers in relation to the monetary statistics of these countries contain especially full and valuable information. These states still adhere to the single gold standard adopted in 1875, silver being subsidiary and for change purposes only.

The imports of gold into Norway in the year 1878 exceeded the exports by \$556,904. The imports of specie into Sweden during the two years 1878 and 1879 exceeded the exports by \$6,135,367, nearly all of this amount being gold.

The paper circulation of both countries consists of bank notes, the governments issuing no paper money. In Denmark the National Bank of Copenhagen, a private corporation, has the sole monopoly of issuing bank notes possessing the quality of legal tender. The bank is authorized to issue as much as may be required by the necessities of trade, but is required to keep a metallic reserve of not less than three-eighths of the volume of bank notes, and bonds of an actual value, one and one-half times as great as the portion of the bank notes in circulation not covered by the metallic reserve.

Switzerland.—The papers transmitted by Minister Fish contain, in addition to statistics of coinage and circulation, the laws governing the organization and coinage of the Federal mint.

Switzerland, being one of the states of the Latin Union, does not depend upon its own coinage for its circulation, as the coins of the States composing the Union circulate freely in all. No gold is coined in the confederation. The coinage of silver from the year 1850 to December 31, 1879, was 50,052,828 francs = \$10,000,000 nearly. No government paper is issued, and bank notes are not a legal tender. The amount of this currency is about \$17,000,000.

Italy.—The dispatch and inclosures from our minister at Rome show the coinage of the Italian mint from 1862 to 1878, inclusive, to have been gold, \$48,175,695; silver, \$96,621,945, and the production of the mines for the years 1875, 1876, 1877: Gold, \$143,013; silver, \$60,988.

The paper circulation is reported by the minister of finance to have been, September 30, 1879, \$315,788,724.

The specie circulation was estimated at \$57,900,000, of which about \$38,000,000 are held as a reserve by the treasury and banks.

Portugal.—The dispatch of Minister Moran, under date of June 26, 1880, contains very desirable and complete information in relation to the monetary affairs of Portugal, including tables showing the amount of gold and silver coined in Lisbon from 1855 to 1879, inclusive, and the imports of coin and bullion from 1869 to 1878, inclusive.

Portugal has the single gold standard, and the English sovereign and

half sovereign are almost the only gold coin in circulation. Silver is a legal tender to the amount of 5 milreis (\$5.40). The Bank of Portugal is the financial agent and depository of the government; its outstanding paper circulation amounts to about \$5,000,000.

Russia.—The papers received through our legation at St. Petersburg will be found valuable as containing the production of the mines of this country, one of the largest producers of the precious metals.

The production of gold in Russia from 1751 to the present time has been 80,000 poods=\$793,760,000. During the ten years from 1868 to 1877 the production was—

Gold, 21,230 poods.....	\$210,635,570
Silver, 8,630 poods.....	5,354,045

The net exports of gold and silver coin, and bullion for ten years from 1869 to 1878, inclusive, was \$107,106,900.

Russia has a large paper circulation, amounting to about \$775,000,000, while the amount of coin in the state banks is about \$115,000,000, of which about \$8,000,000 is silver.

Turkey.—Very interesting dispatches from Hon. Horace Maynard, late United States minister to Turkey, together with official papers from the officers of the Ottoman Empire in relation to the money and finances of that country have been received, also a copy of official decrees in relation to the issue of paper money.

The Government of Turkey coins both gold and silver on its own account; that is, buys the bullion at the imperial mint at Constantinople at the rate of 48 piasters per drachm of pure gold, and 3.12½ piasters per drachm of pure silver of standard fineness, and lower rates for bullion below standard.

The proportion of gold to silver in the Turkish coinage is as 1 to 15.0909.

The coin circulation of Turkey is reported as about \$15,000,000. The British pound and French franc pieces also circulate freely. The principal circulating medium of Turkey has been paper money, but it has become so enormously depreciated that its circulation is almost abandoned, and the government is making efforts to replace it with silver.

The amount of paper outstanding March 31, 1880, was estimated to be in the neighborhood of \$21,000,000. The relative value of Ottoman moneys is shown by the following statement, furnished by Mr. Maynard, giving the rate of exchange between the different kinds:

Date.	Gold.	Silver.	Beshlix (heavily alloyed silver.)	Copper.	Paper.
December 2, 1879	100	106½	117 ³⁷ / ₁₀₀	370	860

To those interested in Turkish finance, the papers in the appendix will be found worthy of perusal.

Mexico.—The dispatches from Mexico show that the production of the mines during the year 1879 was, gold \$989,161, silver \$25,167,763, and that the circulation of coins of other countries has been considerably reduced by exportation. The standard of value is the silver dollar.

Central American States.—The communications from our minister at Guatemala show the amount of gold and silver in circulation in Costa Rica to be about \$2,500,000, in addition to a considerable amount of foreign coins, the values of which are fixed by law. The gold coined

from 1829 to 1877 was \$2,381,381, silver \$373,919. Notwithstanding the rich minerals which abound in the republic, lack of capital and intelligent labor prevents the mines from being worked on the large scale their value merits.

The laws of Nicaragua, promulgated under date of May 29, 1880, provide for the coinage to the extent of \$100,000 of silver pieces of 20, 10, and 5 cents, eight-tenths fine, to be a legal tender in the State. A one-cent coin has also been made by decree of 1878 a legal tender in any quantity. No information with regard to the circulation of Nicaragua has been obtained.

The State of Salvador uses principally coins of other nations and paper as its circulating medium. The coins of the United States, Mexico, and England are preferred and command a premium. The paper circulation is placed at \$60,000.

South American States.—Dispatches have been received from only three of the South American countries, Venezuela, Peru, and Argentine Republic. In Peru gold is the legal standard of value and the inca is the monetary unit. Silver is limited as legal tender to 25 pesetas. The pound sterling of England has been provisionally adopted as legal money. No statistics in regard to the amount of circulation of either coin or paper are furnished.

The circulation of gold and silver in the Argentine Republic is about \$7,000,000, a little over a million of which is held by the First National Bank; about two-thirds of this amount is gold. The paper circulation is very large, amounting to \$364,000,000, and in addition \$9,470,000 of metallic notes. The production of the mines is calculated at 3,800 ounces of gold and 325,000 ounces of silver, during 1879. The gold is obtained from the copper mines and is exported to England. The exportation of specie is chiefly carried on with that country, and amounted in the last year to about \$2,000,000.

Venezuela coins no money; but the French franc, under the name of *bolivar*, is the monetary unit, and all laws relating to finance are adopted from the French. Its silver mines are not worked. The production of the gold mines in the year 1875-76 amounted to \$1,324,000. Paper money is not issued by the government, but the notes of the Bank of Carracas are in circulation to the extent of \$250,000.

Cuba and Hayti.—The dispatch from our consul-general at Havana states that the amount of gold and silver coin in the treasury is nominal only, and that the amount of gold coin in the Bank of Havana, April 30, 1880, was \$10,522,000. The gold in circulation in the island is estimated at \$32,500,000 and silver \$1,000,000. The legal standard of value is the gold dollar (peso).

There is no gold or silver mined and no mint, its coins being imported from Spain. The bills of the Spanish Bank of Havana constitute the paper currency, and amounted on the 30th of April last to \$57,857,000, of which \$44,900,000 had been issued on account of the government. The dollar of this paper circulation is worth about 41 cents in United States gold coin. The imports and exports are about equal.

Two dispatches from Hon. John M. Langston, minister to Hayti, have been received. There is no bank or paper currency of any kind in Hayti. Prior to 1872 it had a paper currency estimated as high as \$800,000,000, of which \$544,675,404 was redeemed at the rate of 300 paper for one of silver, \$2,154,266 in American silver having been provided therefor. The present coin circulation is estimated at about \$5,000,000, consisting chiefly of American and Mexican coins. United States gold and silver coins are held in especial favor, the former selling

generally for a considerable premium, and the latter, as against Mexican dollars, being held preferable, sometimes selling as high as 7 per cent. premium. A million Mexican silver dollars have recently been imported into the island, and a decree was issued compelling merchants to receive them at par.

Japan.—Hon. John A. Bingham transmits under date of April 14, 1880, very complete information in relation to the monetary statistics of Japan. He also notifies this country of the establishment of a branch of the imperial mint at Tokio, and incloses a copy of the regulations governing it. The production of the mines of Japan during the fiscal years of 1878 and 1879 was, gold 36,870 ounces, silver 1,272,515 ounces. The net exports for the same years were, gold 661,787 ounces, silver 3,973,673 ounces. The minister of foreign affairs reports the total paper circulation at \$147,288,681, nearly all of government issue, while the coin and bullion in circulation and reserve amount to nearly \$150,000,000, about one-third being silver.

Egypt.—The communication from our consul-general at Cairo states that the gold piaster is the unit of account in Egypt, and that gold is generally the circulating medium, silver being only used for purposes of change. Of the gold coins, English sovereigns constitute the larger part. There is no paper currency. The treasury reserve is limited. No gold or silver is produced in the country.

African States.—Dispatches have been received from United States consuls at Algiers, Morocco, and Cape of Good Hope, which state that there are no gold mines in any of those countries, and that the production of silver is insignificant. Algiers has no mint, and uses French coins as its principal metallic medium, which amounts to about \$8,500,000 in gold, and \$5,500,000 in silver. The Bank of Algeria is authorized to issue currency, of which there is outstanding between eight and nine millions of dollars.

The circulation of Morocco consists principally of French and Spanish gold and silver coin, the amount of which is not known. Moorish gold coins have disappeared from circulation, having been exported to Europe on account of their high standard. Gold dust and trinkets brought by caravans are exported in small quantities. Morocco has no banks and no paper circulation.

British coin constitutes the circulating medium of the Cape of Good Hope, the amount of which is not known.

BRITISH EMPIRE.

GREAT BRITAIN.

Replies to questions addressed by United States ministers to the Secretary of State for Foreign Affairs, May 22, 1880, respecting the gold, silver, and paper currency of the United Kingdom for the year 1879.

1st. What is the amount of gold coin and bullion in the treasury, in the banks, and in circulation in this country? Gold coin, £122,474,000; gold bullion, £13,139,000.

2d. What is the amount of silver coin and bullion in the treasury, in the banks, and in circulation? Silver coin, £19,017,000; silver bullion, none.*

3d. What is the amount of the outstanding paper currency? Bank of England, £27,650,000; other banks, £3,537,000; Scotland, £5,828,000; Ireland, £6,284,000.

4th. What is the amount of gold annually coined, imported, exported, and consumed in the arts and manufactures? Gold moneys coined, £35,000; gold imported,

* It can hardly be said that there is any stock of silver bullion in the United Kingdom. The amounts imported and exported nearly balance each other, and, as a rule, the silver arriving is again exported with little delay.

£10,618,000; gold exported, £13,555,000; gold consumed in arts and manufactures, note.*

5th. What is the amount of silver annually coined, imported, exported, and consumed in the arts and manufactures? Silver moneys coined, £549,000; silver imported, £10,500,000; silver exported, £11,000,000; silver consumed in arts and manufactures, note.†

	Summary of present fixed issues.	Average weekly circulation, 4 weeks, to April 10, 1880.			Average amount of coin and bullion held for same period.
		In notes of £5 and upward.	In notes of under £5.	Total.	
England: Bank of England....	£15,000,000	£26,837,139	Nil.....	£26,837,139	*£28,738,976
England: 104 private banks....	3,573,502	1,823,221	Nil.....	1,823,221	Not known.
England: 49 joint-stock banks.	2,464,861	1,782,467	Nil.....	1,782,467	Not known.
Total.....				30,442,827	
Scotland: 10 joint-stock banks.	2,676,350	1,655,043	£3,389,165	5,044,208	†£3,702,517
Ireland: 6 joint-stock banks....	6,354,494	3,366,177	2,563,120	5,929,297	†2,514,639
Total.....	30,062,207			41,416,332	34,956,132

* 4 weeks to April 7.

† Gold and silver coin.

Coinage of the British mint in 1879.

Denomination.	Weight.	Number of pieces.	Value.
GOLD.			
	<i>Ounces.</i>		<i>£ s. d.</i>
Sovereigns.....	4,500,724	17,525	17,524 13 10
Half sovereigns.....	4,500,922	35,050	17,525 9 3
Total.....	9,001,646	52,575	35,050 3
SILVER.			
Half crowns.....	409,680,000	901,296	112,062 0 0
Florins.....	492,480,000	1,354,320	135,432 0 0
Shillings.....	656,640,000	3,611,520	180,576 0 0
Sixpences.....	302,400,000	3,326,400	83,160 0 0
Fourpences.....	252,000	4,158	60 6 0
Threepences.....	136,844,000	2,966,568	37,082 2 0
Twopences.....	144,000	4,752	30 12 0
Pence.....	120,000	7,920	33 0 0
Total.....	1,998,560,000	12,176,934	549,054 0 0
BRONZE.			
	<i>Tons.</i>		
Pence.....	73	7,848,960	32,704 0 0
Halfpence.....	20	3,584,000	7,466 13 4
Farthings.....	12	4,300,800	4,480 0 0
Total.....	105	15,733,760	44,650 13 4

AUSTRALIA.

UNITED STATES CONSULAR AGENCY,
Port Adelaide, May 29, 1880.

O. W. SPENCER, Esq.,
United States Consul-General, Melbourne :

SIR : I have the honor to acknowledge from you receipt of dispatch dated February 11, 1880, from the Department of State, Washington, to which I beg to reply as follows :

1st. I inclose the acts of the local government authorizing the stamping and coinage of gold, the only metal so dealt with in the colony, viz, acts Nos. 1 and 14, of 1852.

2d. Parliamentary paper, "Assay-office return," No. 43, of September 14, 1853, showing the quantity of gold dust received by the government (under acts Nos. 1 and 14, 1852), and the number of the £1 gold tokens coined and issued.

3d. The following information refers to the history as well as to the "manufacture, fineness, weight, and legal-tender" of the coinage.

* There are no means of estimating the amount of gold and silver annually used in the arts and manufactures.

In the year 1851 the gold discoveries in New South Wales and Victoria occasioned a great exodus of the adult population of South Australia to the diggings of the neighboring colonies. The local banks—those of “South Australia,” “Australasia,” and the “Union Bank” of Australia—were drained of most of their specie, and the total amount remaining amongst them was not much over £20,000.

The city of Adelaide was almost deserted by the male population; property became unmarketable, and business was almost paralyzed. Soon after this a number of successful diggers returned to Adelaide, bringing with them £50,000 worth of gold dust, but there was not money available to purchase it. The men could only sell a portion and that at the low price of 55s. to 57s. per ounce, the price in Melbourne being 60s. and its *actual value* from 76s. to 78s. per ounce. The establishment soon after this of a police escort, under Inspector Alexander Tolmer, to bring gold from South Australian diggers overland 500 miles from the Victorian diggings to Adelaide, greatly increased the influx of gold dust to the colony.

The report of the chamber of commerce for 1852, referring to the existing state of things, says: “It was at this time, when ruin was staring every one in the face, and when there had already been unmistakable symptoms of a run upon one of the banks, that the committee held a conference with the managers of the three banking institutions with reference to the measures to be adopted to meet the appalling crisis. At this meeting the difficulties of our position were fully discussed. The radical cause of the extreme financial embarrassment which existed was acknowledged to be the sudden and uncontrollable efflux of specie, which was gradually contracting the circulation into dimensions totally inadequate to meet the wants of the community. It was considered if the banks were permitted by law to base their issues for a time on uncoined gold, at such a price as would leave a safe margin for the transmission of the gold to England and its replacement in coin, that perfect security would be afforded to the public, and a palliative, if not a complete corrective, presented to the disorder which prevailed. It was perceived that such a measure, if devised, would enable the banks to afford the required banking accommodation to their customers, so that every solvent man should have an opportunity of retrieving his position. In order that these views might be embodied in some definite shape, it was resolved that the chamber, in conjunction with the banks, should make an urgent application to the government to establish an assay office, for the purpose of assaying and converting gold into stamped ingots, to be exchanged with the banks for their notes.

The governor, Sir H. E. T. Young, on being appealed to, summoned an extraordinary session of the legislature, for the purpose of considering the financial position of the colony in the existing crisis and the best means of improving the same. The result was what is known as the “bullion act” (No. 1 of 1852, herewith). An amended act was passed ten months later, authorizing the coining of “tokens” of the value of £5, £2, £1, and 10s. While samples of the different denominations were struck, the £1 tokens only were put into circulation.

Their intrinsic value being nearly 10 per cent. over the nominal or authorized value, they were bought up by the banks and speculators and sent to England, where they realized a large profit. They were of 22 carats fine gold, and at the authorized value of £3 11s. per ounce they passed as worth only 20s., whereas at the then actual value of gold in the colony (£3 17s. 6d.) they were worth 21s. 10d. each.

Mr. George Elder, chairman of Chamber of Commerce, and managing partner at the time of the firm of A. L. Elder & Co., and Mr. G. Tinline, manager of the Bank of South Australia, were the prime movers in bringing about this most important measure, the operations of which ceased the year after it was passed, no further necessity existing for coining tokens.

4th. “Foreign coins in circulation in the colony,” none. The currency is entirely British, with a trifling exception in regard to sovereigns from the Sydney and Melbourne mints. Occasionally American eagles and dollars, also francs and a few other coins, are brought to Adelaide, but are sold or exchanged, not being recognized as currency.

5th. Copy of any law authorizing issue of paper money by the government or by banks, &c.

The local acts 1 and 14, of 1852, also private acts of the National Bank of Australia (of 1859, 1860, and 1863, herewith) refer to this matter. The three last are sent as showing the extent to which the banks are required to keep bullion or coin to cover their notes in circulation. The relative value of the paper currency is the same as that of coined gold and silver, *i. e.*, a local bank note £1 is worth one sovereign, or twenty shillings, and so on.

As a matter of some interest in connection with the financial arrangements of the colony I take the liberty of forwarding, in addition to the documents asked for, the savings-bank act (No. 22, of 1875); also the returns of the savings-bank from its foundation to December 31, 1879.

I have the honor to be, sir, yours, obediently,

J. W. SMITH,
United States Consular Agent.

MELBOURNE, June 23, 1880.

SIR: In replying to your letter of the 23d April last, requesting information as to various points connected with the currency of this colony, I must apologize for the delay which has occurred.

The coinage of gold at the branch of Her Majesty's mint is regulated by the following acts and order of Her Majesty the Queen in council. The act (imperial) 29 and 30 Vict., cap. 65 (1866) enabled Her Majesty to declare gold coins issued from any colonial mint a legal tender for payments in the United Kingdom and colonies. An act was passed by the colonial legislature of Victoria in 1867, No. cccvii, to make permanent provision for a branch of the Royal mint in Victoria. An order of Her Majesty in council was issued on the 7th August, 1869, constituting this branch of Her Majesty's mint. An imperial act was passed in 1870 (33 Vict., cap. 10) repeating the above-mentioned act of 1866, but again conferring the power upon Her Majesty in council to establish branches of the Royal mint in any British possession.

This act is that which substantially governs the coinage in the United Kingdom and in the colony. I have no copies of these acts at my disposal.

With regard to the second question contained in the inclosure of your letter, I append the following statement, showing the amount of gold coin issued from this branch of Her Majesty's mint during each year since it was opened:

Period.	Coin issued.
1872*	£748,000
1873	834,500
1874	1,373,000
1875	1,888,000
1876	2,124,000
1877	1,527,000
1878	2,171,000
1879	2,740,000
1880, to June 30	1,539,800
Total	14,945,300

No silver or bronze coin is manufactured by this branch of Her Majesty's mint; all such coin is obtained from the London mint.

The reply to question No. 3, as regards fineness, weight, or legal-tender quality of the coins, is contained in the act 33 Vict., cap. 10, and the schedule attached thereto. As regards manufacture, I may bring under your notice a process which has been in operation in this branch of Her Majesty's mint since its opening in 1872. The whole of the gold deposited here for coinage has been subjected to it. As you are doubtless aware, all gold in its natural state contains more or less silver, and frequently is combined with other metals, which render it brittle or otherwise unfit for coinage. For many years it was found impossible, from cost in these colonies of the necessary acids, economically to free the native gold from these foreign metals; all difficulty, however, has been overcome by the adoption of the chlorine process, the invention of Mr. F. Bowyer Miller, formerly one of the assayers of the Sidney branch of the Royal mint, and now the superintendent of the bullion office in this department.

By this process the gold is rendered tough and the silver is separated, and becomes a valuable source of revenue.

The process has this additional advantage, that, whereas under the other known methods of refining much time was lost, a few hours now suffice for the treatment of the largest parcels. Eighteen thousand ounces of gold have been refined and delivered for work in one working day.

The plant required for this operation is of the simplest kind and the chemical agents used are of the most inexpensive character.

I may further mention as regards the process of manufacture in this branch of Her Majesty's mint, that owing to the accuracy and efficiency of the rolling and cutting machinery, it is found unnecessary to use, as is frequently the case in other mints, any operation for the adjustment of heavy blanks, the proportion of coin from blanks being 95 per cent., or an outturn from the bars of fully 65 per cent.

Question 4. The coins of other countries are not in circulation in this colony.

I am not aware of any law authorizing the issue of paper money by the government of this colony, neither is there, as far as I am aware, any act or decree in existence in this colony by which any legal-tender quality is given to paper money. I may add that an act (colonial) was obtained by the National Bank of Australia during the session of 1879, No. dxx, 41, containing, amongst other provisions, a clause extending the term for issue and reissue of bank notes and bills.

* From June 12, the day the mint was opened.

In conclusion I would desire to draw your attention to the annual reports made to the lords commissioners of Her Majesty's treasury by the deputy masters of Her Majesty's mint since 1870, and presented to both houses of the Imperial Legislature by Her Majesty's command.

In these reports there will be found every information upon the coinage of the United Kingdom, to which that of this colony is exactly similar.

Copies of these reports are doubtless supplied for the information of the Government of the United States of North America.

I have the honor to be, sir, your obedient servant,

V. DELVES BROUGHTON.

The CONSUL-GENERAL of the *United States, &c.*

UNITED STATES CONSULATE-GENERAL,
Melbourne, August 23, 1880.

Hon. WM. M. EVARTS,
Secretary of State, Washington, D. C. :

SIR: In compliance with the instructions contained in your circular dispatch of April 30, relative to the amount of gold and silver coin, bullion, and paper currency in Victoria, I have the honor to submit the following report:

I. As the government keeps its cash deposits in bank, there is no gold or silver coin in the treasury.

II. With regard to the gold and silver coin, bullion, and paper currency in the banks of the several Australian colonies, I beg leave to refer you to Statement A, herewith inclosed.

According to the returns received at this consulate from a number of the principal banks of this city, as will appear by reference to Statements B, C, D, E, and F, herewith transmitted, the average of silver coin held by them during the past three years is about 9 per cent. of the total amount of the silver and gold deposited in their vaults.

III. It has been found impracticable to obtain any reliable data as to the amount of gold and silver in circulation, as well as that consumed in the arts and manufactures.

IV. The product of the gold mines in Victoria for 1879 was 758,947 ounces, valued in round numbers at \$15,000,000. The average annual product during the past ten years has been 1,063,148 ounces, valued at \$20,000,000.

V. No silver ore was raised in this colony during the past year, but 23,680 ounces, valued at \$27,000, were separated from the gold smelted at the mint.

VI. During the year 1879, there were received at the Melbourne branch of the Royal mine 493,062 ounces of gold, valued at \$9,861,240.

The imports of gold into Victoria for the same period amounted to \$5,548,044, whilst the exports amounted to \$12,543,019.

VII. No silver is coined in Victoria. In 1879 the imports of silver coin into the colony amounted to \$498,023, and the exports of silver and silver coin to \$164,225.

VIII. In reply to the second series of interrogatories, from I to V, inclusive, I may say that the standard coins in circulation in the colonies, the legal standard of value, the standard weight and fineness of the monetary unit, together with the law fixing the coin standard and governing minting operations, are the same as for English sterling.

I am, sir, very respectfully, your obedient servant,

O. M. SPENCER,
Consul-General.

Gold and silver coin, bullion, and paper currency in the banks of Australasia.

FOR THE QUARTER ENDED JUNE 30, 1879.

Colony.	Gold, silver, and other coin.	Gold and silver bullion.	Notes in circu- lation.
Victoria.....	\$11,810,436	\$1,333,105	\$5,622,452
New South Wales.....	11,891,760	372,711	5,389,439
New Zealand.....	7,810,411	806,223	4,005,086
South Australia.....	3,069,321	64,053	2,238,673
Queensland.....	3,866,454	496,188	1,583,778
Tasmania.....	1,429,758	.....	637,142
Western Australia.....	387,782	.....	90,035
Total.....	40,265,922	3,066,280	20,466,605

FOR THE QUARTER ENDED SEPTEMBER 30, 1879.

Victoria.....	\$13,444,548	\$1,211,029	\$4,978,347
New South Wales.....	12,446,862	517,572	5,246,875
New Zealand.....	8,450,633	897,733	4,292,024
South Australia.....	3,129,534	26,479	2,090,517
Queensland.....	4,605,169	466,352	1,535,040
Tasmania.....	1,583,423	.....	615,880
Western Australia.....	402,581	.....	84,190
Total.....	44,062,750	3,119,165	18,842,873

FOR THE QUARTER ENDED DECEMBER 31, 1879.

Victoria.....	\$15,351,691	\$1,561,071	\$5,808,184
New South Wales.....	13,229,473	442,511	5,592,830
New Zealand.....	9,401,494	893,295	4,298,550
South Australia.....	2,981,413	31,355	2,167,208
Queensland.....	5,151,117	512,136	1,585,919
Tasmania.....	1,574,917	.....	612,352
Western Australia.....	451,490	.....	96,488
Total.....	48,141,595	3,440,368	19,661,531

FOR THE QUARTER ENDED MARCH 31, 1880.

Victoria.....	\$18,212,988	\$1,427,846	\$5,758,257
New South Wales.....	15,092,876	316,371	5,684,033
New Zealand.....	9,524,417	782,898	4,416,120
South Australia.....	3,349,841	38,737	2,485,881
Queensland.....	5,125,490	476,873	1,579,165
Tasmania.....	1,680,733	.....	635,278
Western Australia.....	478,051	.....	102,445
Total.....	53,464,396	3,042,725	20,661,179

STATEMENT OF AVERAGE AMOUNT OF COIN HELD BY THE LONDON CHARTERED BANK OF AUSTRALASIA IN VICTORIA DURING THE PAST THREE YEARS.

Gold coin.....	£155,855
Silver coin.....	20,420
Total.....	176,275

MELBOURNE, September 17, 1879.

Average coin held by the Colonial Bank of Australasia for each half year from April 1, 1876, to March 31, 1879.

For half year ending—	Silver.	Gold.
September 30, 1876.....	£13,710	£96,630
March 31, 1877.....	14,140	132,710
September 30, 1877.....	12,230	140,990
March 31, 1878.....	13,250	111,570
September 30, 1878.....	14,670	89,140
March 31, 1879.....	16,820	84,700

Average of coined gold, silver, and copper held by the Oriental Bank Corporation, Victoria, during the years 1876, 1877, 1878, 1879.

Year.	Coin.	Half year ending—	
		June 30.	December 31.
1876	Gold.....	£ 132,013 3 4	£ 168,169 3 4
	Silver.....	5,138 13 7	4,331 7 10
	Copper.....	109 15 8	279 5 5
1877	Gold.....	177,842 0 0	130,612 11 8
	Silver.....	4,490 7 9	5,385 14 1
	Copper.....	215 14 8	210 18 1
1878	Gold.....	166,229 3 4	120,568 6 8
	Silver.....	5,037 6 7	6,879 5 6
	Copper.....	312 17 9	266 7 5
1879	Gold.....	136,838 0 0	.....
	Silver.....	7,896 11 0	.....
	Copper.....	225 14 0	.....

Memorandum of average amounts of coin held by the Union Bank of Australia in Victoria for the following half-yearly periods.

		£	s.	d.	£	s.	d.
1876.							
June 30.	Gold.....	223,506	0	0			
	Silver.....	10,614	3	1			
					234,120	3	1
Dec. 31.	Gold.....	223,693	0	0			
	Silver.....	9,912	19	10			
					233,605	19	10
1877.							
June 30.	Gold.....	202,672	0	0			
	Silver.....	9,347	10	0			
					212,019	10	0
Dec. 31.	Gold.....	175,020	0	0			
	Silver.....	7,487	18	11			
					182,507	18	11
1878.							
June 30.	Gold.....	225,130	0	0			
	Silver.....	8,646	2	8			
					233,776	2	8
Dec. 31.	Gold.....	215,397	0	0			
	Silver.....	9,028	18	00			
					224,425	18	0
1879.							
June 30.	Gold.....	317,800	0	0			
	Silver.....	9,567	16	2			
					327,367	16	2

UNION BANK, MELBOURNE, September 8, 1879.

Average amount of gold and silver coin held by the Commercial Bank of Australasia (limited) for the half year ending—

1876.			
Dec. 31.	Gold.....	£80,754	
	Silver.....	5,884	
			£86,638
1877.			
June 30.	Gold.....	86,258	
	Silver.....	5,699	
			91,957
Dec. 31.	Gold.....	74,498	
	Silver.....	5,361	
			79,859

1878.			
June 30.	Gold	£71,226	
	Silver	7,151	
			£78,377
Dec. 31.	Gold	62,094	
	Silver	4,829	
			66,923
1879.			
June 30.	Gold	52,220	
	Silver	6,526	
			58,746

National Bank of Australia—Average gold and silver coin held in Victoria during half years ending—

		£	s.	d.	£	s.	d.
1876.							
June.	Gold	164,649	15	10			
	Silver	14,003	13	5			
					178,653	9	3
Dec.	Gold	202,576	10	00			
	Silver	13,385	00	3			
					215,961	10	3
1877.							
June.	Gold	152,032	13	4			
	Silver	10,657	17	5			
					162,690	10	9
Dec.	Gold	159,490	2	00			
	Silver	9,288	12	9			
					168,778	14	9
1878.							
June.	Gold	161,349	16	8			
	Silver	12,380	6	5			
					173,730	3	1
Dec.	Gold	146,135	10	00			
	Silver	13,818	2	1			
					159,953	12	1
1879.							
June.	Gold	199,053	8	4			
	Silver	12,591	7	4			
					211,644	15	8

UNITED STATES CONSULATE-GENERAL,
Melbourne, September 20, 1880.

Hon. JOHN HAY,
Assistant Secretary of State, Washington, D. C.:

SIR: I transmit herewith a copy of the report of the consular agent at Port Adelaide on the gold and silver coin, bullion, and paper currency of the Colony of South Australia, made, in compliance with instructions in department circular of April 30, for the information of the Hon. Secretary of the Treasury.

I am, sir, very respectfully, your obedient servant,

O. M. SPENCER,
Consul-General.

UNITED STATES CONSULATE,
Port Adelaide, S. A., September 13, 1880.

O. M. SPENCER, Esq.,
United States Consul-General, Melbourne:

SIR: In reply to your circular of April 30, I have the honor to furnish the following information respecting the currency of the British colony of South Australia.

I would first beg to explain that the delay in obtaining the information has arisen from the unwillingness of the banks to supply that required from them, and now, after some weeks, the returns are incomplete, one of the eight banks trading in the colony having withheld its returns.

1st. No quantity of coin is kept in the government treasury, the government funds being lodged in the banks.

The circulation in the country cannot be arrived at even approximately, but may be roughly guessed from the banks' returns of coin of all kinds in their coffers (£922,850), to which may be added for a population of about 270,000 souls, say, £500,000 in general circulation, making a grand total of £1,442,850.

Besides this metallic currency, there are bank-notes to the amount of £474,570 (vide printed returns herewith); notes and bills discounted during the quarter ending June 30 amounting to £5,917,706 18s. 3d.

The total amount of deposits in the banks at the same date was £4,011,518 7s. 5d. The total gold coin in seven of the eight banks trading in Adelaide on July 3d was £818,336.

2d. The total silver coin in the same banks was £80,513 at the same date, July 5th.

3d. The amount of outstanding paper currency (bank notes) as per return June 30th was £474,570. No later return will be made up till another quarter has expired.

4th. The amount of gold produced from the mines is at present but small, and very uncertain in quantity. There is not much gold mining done in South Australia proper, though many good reefs are known to exist. Some very rich reefs are being worked in the northern territory portion of the province.

5th. The amount of silver produced is at present *nil*, but there are many mines of galena, which, when worked, yielded from 40 to 70 ozs. of silver to the ton of lead.

6th and 7th. No coining is done in South Australia. The imports and exports of gold and silver are fluctuating and uncertain.

The quantity consumed in the arts and manufactures also varies considerably. Last year (1879) it amounted approximately to 3,590 ozs. of gold and 16,000 of silver.

In addition to the foregoing, and in reply to the second series of interrogatories, I beg to state:

1st. The standard coin in circulation are the British currency solely, and this reply covers the following questions—2d, 3d, and 4th. (See also reply No. 1, first series.)

5th. Copies of all statutes relating to currency and banking were forwarded you on May 29, in reply to your letter of February 11, of the current year, viz:

The bullion act No. 10, of 1852, also No. 1 and 14, of 1852, No. 43, of September 14, 1853, and private banking acts of 1859, '60, and '63.

I have the honor to be, sir, your obedient servant.

J. W. SMITH,
U. S. Consular Agent.

Table showing the amounts of gold and silver held by the banks of South Australia, and their note circulation, June 30, 1880.

Coin	£922,849 17s. 4d.
Bullion	8,551 09 0
Notes	474,570 08 5

INDIA.

CONSULATE-GENERAL, U. S. A.,
Calcutta, October 9, 1879.

Hon. F. W. SEWARD,
Assistant Secretary of State, Washington, D. C.:

SIR: Referring to dispatch No. 133, from the Department, under date of May 23, I have the honor herewith to transmit a communication received from the Hon. R. B. Chapman, secretary of the Government of India, together with statements containing the information desired by the honorable Secretary of the Treasury, relative to the amount of gold and silver coin and bullion and paper currency in India.

I am, sir, your obedient servant,

A. C. LITCHFIELD,
Consul-General, U. S. A.

To the Consul-General for the United States of America, Calcutta:

SIR: In reply to your letter No. 290, dated the 26th August, 1879, I am directed to forward the accompanying statements which contain all the information available in

this office respecting the amount of gold and silver coin and bullion and paper currency in India.

2. We have no better means of estimating the amount of coin and bullion in circulation in India than elsewhere, but it is not believed that the amount of coin actually current exceeds 50 or 60 millions sterling. The rest of our large importations is believed to be hoarded in the shape of coin, personal ornaments, and otherwise.

3. There is practically no production of gold and silver in India. Silver mines were opened in Waziri Rupi, in the Kulu district, some years ago, but the enterprise has been abandoned, temporarily at all events, and no appreciable amount of metal has in any recent period been extracted from them.

4. The reports of Mr. Brough Smyth, who has been specially retained by the State to explore and report upon the gold-bearing strata of Southern India, indicate that gold-bearing quartz reefs of varying richness and extent exist in the Wynaad (Malabar) district, but, as yet, operations have been mainly confined to prospecting. In various places in the Punjab, and in other parts of India, gold is washed in the sands of the rivers, but the quantity found is small, and no statistics of the produce exist.

5. Strictly speaking, the use of the precious metals in the arts and manufactures is, as elsewhere, unimportant; but both silver and gold are largely hoarded in the shape of solid personal ornaments.

I have the honor to be, sir, your most obedient servant,

R. B. CHAPMAN,

Secretary to the Government of India, Simla, the 29th September, 1879.

Amount of gold and silver coin and bullion held in the government treasuries in British India on 31st March of each year from 1875 to 1879.

	Gold.			Silver.		
	Coin.	Bullion.	Total.	Coin.	Bullion.	Total.
1870.....	£4,720	£11,240	£15,960	£11,657,351	£248,531	£11,905,882
1871.....	797	34,081	34,878	13,719,363	437,151	14,156,514
1872.....	688	36,567	37,255	17,799,345	632,403	18,431,748
1873.....	868	36,725	37,593	14,904,716	538,612	15,443,328
1874.....	865	34,447	35,312	16,064,354	1,034,655	11,099,009
1875.....	507	34,629	35,136	12,011,850	571,984	12,583,834
1876.....	25,546	16,813	42,359	13,351,331	826,885	14,178,216
1877.....	19,894	27,380	47,274	10,278,857	823,517	11,102,374
1878.....	20,517	104	20,621	11,221,720	250,443	11,472,163
1879.....	17,398	18	17,416	9,733,467	238,362	9,971,829

Coin and bullion, almost all silver, held at the banks of Bengal, Madras, and Bombay, on the 31st March of each year from 1875 to 1879.

	Bengal.		Madras.		Bombay.		Total.	
	Gold and silver coins held at the head office.	Bullion.	Silver coin held at the head office.	Bullion.	Silver coin held at the head office.	Bullion.	Coin.	Bullion.
	<i>Rupees.</i>	<i>Rupees.</i>	<i>Rupees.</i>	<i>Rupees.</i>	<i>Rupees.</i>	<i>Rupees.</i>	<i>Rupees.</i>	<i>Rupees.</i>
1875.....	3,270,575	46,000	3,381,083	.....	1,519,259	.....	8,171,187	46,000
1876.....	3,654,005	20,000	2,065,840	.....	3,585,961	.....	9,305,806	20,000
1877.....	1,499,510	615,000	4,808,197	.....	4,984,790	.....	11,292,497	615,000
1878.....	1,742,570	.....	2,166,391	.....	1,672,035	.....	5,580,996	.....
1879.....	1,642,525	.....	1,793,587	.....	2,675,833	.....	6,111,945	.....

Imports, exports, and coinage of gold and silver of British India, and government paper circulation issued by Bengal, Madras, and Bombay presidencies.

Date.	Imports.		Exports.		Coinage.		Paper currency.
	Gold.	Silver.	Gold.	Silver.	Gold.	Silver.	
1835-'36.....	£333,399	£1,833,673	£3,481	£221,777	£197,494	£2,329,020	.....
1836-'37.....	421,694	1,646,840	1,970	307,958	6,815	3,872,189	.....
1837-'38.....	462,588	2,215,020	31,718	248,076	25,426	3,375,576	.....
1838-'39.....	266,531	2,850,380	7,606	205,250	34,473	3,970,619	.....
1839-'40.....	231,223	1,937,022	4,580	286,551	79,156	3,069,967	.....
1840-'41.....	137,884	1,707,483	572	305,818	56,772	2,924,570	.....
1841-'42.....	166,360	1,678,086	737	394,858	23,101	3,760,264	.....
1842-'43.....	212,441	3,235,011	1,280	282,566	.....	3,294,787	.....
1843-'44.....	407,038	4,743,740	515	1,048,298	16,634	4,672,763	.....
1844-'45.....	719,453	3,176,048	9,353	1,187,487	26,339	4,696,814	.....
1845-'46.....	551,966	1,901,357	7,490	1,028,867	30,142	3,856,218	.....
1846-'47.....	852,839	2,087,082	5,890	708,833	42,734	2,920,852	.....
1847-'48.....	1,048,778	923,185	9,662	1,416,376	46,291	1,782,257	.....
1848-'49.....	1,401,748	2,798,628	52,830	2,484,724	70,470	2,578,866	.....
1849-'50.....	1,150,548	2,235,792	42,555	962,185	44,147	2,411,203	.....
1850-'51.....	1,155,810	2,656,498	2,016	539,273	123,717	2,616,417	.....
1851-'52.....	1,338,778	3,713,280	71,165	847,923	62,553	4,248,491	.....
1852-'53.....	1,341,106	5,490,227	168,805	885,203	.....	5,509,965	.....
1853-'54.....	1,078,708	3,770,643	17,265	1,464,899	145,679	5,253,437	.....
1854-'55.....	882,721	1,145,137	151,431	1,115,537	2,676	1,365,901	.....
1855-'56.....	2,508,353	8,792,793	2,108	598,418	167,863	6,973,659	.....
1856-'57.....	2,176,002	12,237,695	84,788	1,164,448	128,302	10,779,286	.....
1857-'58.....	2,830,084	12,985,332	47,011	766,384	43,783	12,551,303	.....
1858-'59.....	4,437,339	8,379,692	10,886	651,350	132,273	6,542,267	.....
1859-'60.....	4,288,037	12,068,926	3,803	921,363	64,307	10,677,924	.....
1860-'61.....	4,242,441	6,434,636	9,872	1,106,627	65,038	5,192,328	.....
1861-'62.....	5,190,432	9,711,545	6,007	675,089	58,667	7,070,830	£3,690,000
1862-'63.....	6,881,666	13,627,398	33,410	1,077,243	130,666	9,251,468	4,926,000
1863-'64.....	8,925,412	14,037,187	27,106	1,240,352	54,354	11,477,425	5,350,000
1864-'65.....	9,875,032	11,468,320	35,068	1,409,522	95,672	10,358,423	7,427,327
1865-'66.....	6,372,839	20,184,408	648,419	1,615,234	17,665	14,507,049	6,898,481
1866-'67.....	4,927,395	9,670,712	739,144	1,734,019	27,725	6,118,857	8,090,868
1867-'68.....	4,773,786	6,997,937	166,457	839,948	21,534	4,313,285	9,069,569
1868-'69.....	5,176,976	9,978,978	17,624	1,377,956	25,156	4,207,031	9,959,296
1869-'70.....	5,690,399	8,264,408	98,282	946,264	78,510	7,473,560	10,472,883
1870-'71.....	2,785,975	2,662,237	500,453	1,720,313	4,143	1,718,197	10,437,291
1871-'72.....	3,573,778	8,007,525	8,434	1,487,209	15,412	1,690,394	13,167,917
1872-'73.....	2,622,371	1,934,214	79,009	1,219,070	31,795	3,980,927	11,135,061
1873-'74.....	1,648,807	4,143,726	266,169	1,647,902	15,498	2,370,007	9,249,761
1874-'75.....	2,089,236	6,051,810	215,701	1,409,608	14,034	4,896,884	11,236,438
1875-'76.....	1,836,381	3,464,341	291,250	1,908,986	17,150	2,550,218	10,909,927
1876-'77.....	1,443,712	9,992,408	1,236,362	2,793,536	.....	6,271,122	11,617,811
1877-'78.....	1,578,927	15,774,522	1,110,798	1,100,197	15,636	16,180,326	13,574,750
1878-'79.....	1,463,049	5,593,699	2,359,223	1,623,005	.....	.....	11,423,645

No. 141.]

GOVERNMENT OF INDIA,
DEPARTMENT OF FINANCE AND COMMERCE,
Simla, the 21st April, 1880.

To A. C. LITCHFIELD,
Consul-General of the United States, Calcutta:

* * * * *

Question 2. The amount and the several denominations of coin struck in the Indian mints in each year from 1835-'36 to 1878-'79 will be found in the annexed statement, marked "B." Similar information for the period previous to 1835-'36 is not available, nor can particulars of copper coinage in years previous to 1870-'71 be given.

Question 3. The following statement gives particulars regarding the fineness, weight, &c., of the coins in circulation:

GOLD COINS.

	Pure gold.	Alloy.	Total weight.
	Grains.	Grains.	Grains, troy.
A double gold mohur, or 30-rupee piece	330	30	360
A mohur, or 15-rupee piece	165	15	180
Two-thirds of a mohur, or 10-rupee piece	110	10	120
One-third of a mohur, or 5-rupee piece	55	5	60

No gold coin is legal tender on payment or account.

SILVER COINS.

[Legal tender in payment of all engagements.]

	Pure silver.	Alloy.	Total weight.
	Grains.	Grains.	Grains.
A government rupee.....	165	15	180
A half-rupee.....	82½	7½	90
Legal tender for fractions of a rupee only:			
A quarter, or 4-anna piece.....	41½	3½	45
An eighth of a rupee, or 2-anna piece.....	20¾	1¾	22½

COPPER COINS.

[Legal tender for fractions of a rupee only.]

	Grains.
A double pice, or half-anna.....	200
A pice, or quarter-anna.....	100
A half-pice, or one-eighth of an anna.....	50
A pie being one-third of a pice, or one-twelfth of an anna.....	33½

The following variation from the standard weight and fineness is allowed:

GOLD COINS.

An amount not exceeding two thousandths in weight and two thousandths in fineness.

Silver coins.	Allowance in weight.	Fineness.
Rupee and half-rupee.....	Five thousandths.....	Two thousandths.
Quarter-rupee.....	Seven thousandths.....	
Eighth of a rupee.....	Ten thousandths.....	Three thousandths.

Question 4. The coins of other countries or of native Indian States do not circulate in British India.

Question 5. A copy of the Indian Paper Currency Act (iii) of 1871, which authorized the circulation of paper money in India, is included. The amount of the several denominations of currency notes in circulation on 31st March, 1879, will be found in the annexed statement, marked "C."

No banks or other corporations in India are allowed to issue paper money, the only notes in circulation being those of the State. The amount of the metallic currency is not known, and no comparison can therefore be made between the relative values of the two, but the metallic currency largely exceeds the paper issue, and the government holds a reserve of metal and of government bonds against its issue of paper equal in amount to that of the whole paper issue. A statement of the paper in issue and the silver held in reserve against it is published monthly, in the Official Gazette of India.

Government currency notes are accepted everywhere for their nominal metallic value.

CONSULATE-GENERAL, UNITED STATES OF AMERICA,
Calcutta, July 21, 1880.

SIR: Referring to a communication from the honorable Secretary of State, marked "special," under date of April 30, 1880, I have the honor herewith to transmit a copy of the communication received from the Hon. R. B. Chapman, secretary of the Government of India financial department, containing information desired by the Secretary of the Treasury relative to the amount of gold and silver coin and bullion and paper currency in India up to the latest practicable date, March 31, 1880, together with the information desired in the last five additional interrogatories submitted therewith.

I am, sir, your obedient servant,

A. B. COBB,
Vice-Consul-General, U. S. A.

Hon. JOHN HAY,
Assistant Secretary of State, Washington, D. C.

GOVERNMENT OF INDIA,
DEPARTMENT OF FINANCE AND COMMERCE,
Simla, July 7, 1880.

To the Consul-General for the United States of America:

SIR: I am directed to acknowledge the receipt of your letter No. 353, dated 19th June, asking for certain further information respecting the coinage and currency of British India.

2. With my letter No. 2388, dated the 29th September, 1879, five statements were forwarded to you, giving certain statistics of gold and silver and paper money of India, to the end of March, 1879. I now note below* the corresponding figures for the year ending 31st March, 1880. The general remarks made in my letter of the 29th September still hold good.

3. A volume of the miscellaneous and financial statistics published by the Government of India, which embodies much of this information, will, in future, be regularly sent to you for transmission to the Secretary of State for the United States.

4. The replies to the five additional questions asked in your letter are as follows:

I. The standard coin in circulation are the rupee and half-rupee. The rupee is the unit of the money account.

II and III. Silver is the legal standard of value.

IV. The standard weight of the rupee is 180 grains, troy, and its fineness $\frac{1}{12}$. The rupee thus contains 165 grains of pure silver.

V. A copy of act (xxiii) of 1870, fixing the coin standard of British India, was forwarded to you with my letter, No. 141, dated the 21st April, 1880. A copy of the rules for the receipt and coinage of bullion at the mints is now forwarded.

I have the honor to be, sir, your most obedient servant,

R. B. CHAPMAN,
Secretary of the Government of India.

CANADA.

An act respecting the currency, May 22, 1868.

* * * * *

2. On and after the said day, the pound currency throughout all Canada shall be held to be equivalent to and to represent eighty-nine grains and six hundred and one thousandths of a grain, troy weight, of pure gold, or ninety-seven grains and seven hundred and forty-seven thousandths of a grain of gold of the standard of fineness prescribed by law for the gold coins of the United Kingdom, on the 1st day of August, one thousand eight hundred and fifty-four.

* 1. Amount of gold and silver coins and bullion held in the government treasuries on the 31st March, 1880: Gold, 1,018 rupees; silver, 90,078,405 rupees; total, 90,079,423 rupees.

2. Amount held by presidency banks: Gold, 186,735 rupees; silver, 7,800,009 rupees; total, 7,986,744 rupees.

3. Imports in 1879-'80:

	Gold.	Silver.	Total.
	<i>Rupees.</i>	<i>Rupees.</i>	<i>Rupees.</i>
Imports	20,503,929	96,045,019	116,548,948
Exports	2,998,893	17,352,586	20,351,479
Net imports.....	17,505,036	78,692,433	96,207,469

Currency notes in circulation on the 31st March, 1880, 123,578,270 rupees.

Reserve:	Rupees.
Silver coin.....	55,572,976
Silver bullion.....	8,033,547
Government securities.....	59,970,747
	123,577,270

5. Amount of coinage at the Indian mints in 1879-'80, 102,146,055 rupees.

3. The pound sterling, or British sovereign, of the weight and fineness now established by law shall be held to be equal to five dollars and four cents and one-third of a cent currency, and any British sovereign of the present lawful weight shall pass current and be a legal tender in Canada for that sum; and any other British gold coins coined or to be coined, while of lawful weight, shall pass current and be a legal tender for sums proportionate to the quantity of fine gold in them, and to be declared by proclamation of the governor.

4. Any gold or silver or copper coins which Her Majesty may direct to be struck for use in Canada shall, by such names as shall be assigned to them in the governor's proclamation declaring them lawful money of Canada, pass current and be a legal tender in Canada, at the rate assigned to them respectively by proclamation, which shall be (as nearly as may be) in the same proportion to their intrinsic values as the rate at which the gold, silver, and copper coins of the United Kingdom pass current there, bear to their intrinsic values respectively.

5. British silver coins, while of lawful weight and current in the United Kingdom, shall pass current and be a legal tender in Canada to the amount of ten dollars in any one payment at the following rates: the crown at one dollar and twenty-five cents; the florin at fifty cents; the shilling at twenty-five cents; and the other silver coins at rates bearing the same proportion to their nominal value in sterling.

6. British copper coins while current in the United Kingdom shall, unless and until it is otherwise ordered by proclamation of the governor, pass current and be a legal tender in Canada, to the amount of one shilling in any one payment, at the rate of two cents for every penny of their nominal sterling value.

7. The half-eagle of the United States of America coined after the adoption by the said United States of the basis of value hereinbefore mentioned, and being of the intrinsic value aforesaid, shall, on the conditions to be defined in the proclamation of the governor, pass current and be a legal tender in Canada to any amount, at the rate of five dollars, as shall also the other gold coins of the United States and of France, or of any other nation, coined under the agreement made at the International Monetary Conference, at rates proportional to their intrinsic value and to be mentioned in such proclamation, which may also fix a specific percentage of difference between the new currency and the old, and may contain such conditions and limitations as to weight, fineness, stamp, date, remedy, or tolerance, as the governor may think proper.

8. The governor may by proclamation, from time to time, declare that the silver coins of the United States coined after their adoption of the basis of value hereinbefore mentioned and containing in the half-dollar not less than one hundred and seventy-nine grains troy weight, of the fineness of nine-tenths, and so in proportion for any coin of greater or less nominal value, shall on and after a day to be therein named, pass current and be a legal tender in Canada, to the amount of ten dollars in any one payment; and any such proclamation may contain such conditions and limitations as to weight, fineness, stamp, date, remedy or tolerance, as the governor may think proper, and may be revoked or amended by any subsequent proclamation."

* * * * *

GERMANY.

LEGATION OF THE UNITED STATES,
Berlin, November 17, 1879.

SIR: Although other political matters, especially rumors regarding an alliance between the German Empire and Austro-Hungary, have taken the leading place in the public mind of late, there are frequent evidences of the fact that the monetary policy of the empire is by no means escaping public attention.

The newspapers now report that the Bavarian Government, which, when it presented its budget, had decided to coin only 21,988 marks of gold for the coming year, had stated that the condition of affairs had changed since then; that it has been found impossible to recirculate the silver thaler (3 marks) pieces as was anticipated; and that, therefore, an additional 1,000 pfund of gold must be coined.

Commenting upon this report, a Berlin journal of liberal views in politics expresses the belief that the Prussian Government will have to follow this example of Bavaria.

In the Saxon Landtag an effort, it is stated, has just been made to pass a resolution asking the German Bundesrath (federal council) to reintroduce the double monetary standard. The supporters of the resolution pointed to the depreciation in the value of silver in mines in consequence of its demonetization as a reason for the adoption of their motion; and it was stated as a proof of this that the yearly produce of the Freiberg mines has fallen off to the extent of about one million marks.

The chamber of commerce for Schweinetz and Waldenburg has petitioned the Landtag in favor of the remonetization of silver, and urging as a reason the injustice of

paying debts with a depreciated currency. It is argued by the press that this is virtually a plea for the reintroduction of the old single and silver standards.

A report of the Saxon Institute of Engineering concludes with a request to support the imperial chancellor in his views regarding the monetary question, and thus counteract the mischievous effects of the schemes of *doctrinaire* political economists.

From these utterances it will be seen that the matter has by no means been dropped, but that it continues to elicit much consideration on both sides.

Since my dispatch of the 23th ultimo (No. 64) I have heard no more from the German Government on the subject.

I have the honor to be, with great respect, your obedient servant,

AND. D. WHITE.

Mr. White to Mr. Evarts.

No. 109.]

LEGATION OF THE UNITED STATES,
Berlin, April 12, 1880.

SIR: I have the honor to inform you that by a bill modifying Article IV of the coinage law of July 9, 1873, which Prince Bismarck, as chancellor of the empire, has just laid before the federal council and which will doubtless soon become a law, the total amount of silver coinage in Germany is to be increased from 10 marks per head of the population to 12 marks.

In the introduction of the bill it is stated that the provisions of the article referred to were meant to be but temporary, and that it has now become apparent that the silver coined under the act of 1873 is insufficient for the needs of the people. It is further stated that on December 31, 1878, and December 31, 1879, the amount of silver coin circulating in the German Empire was as follows:

	1878.	1879.
	<i>Marks.</i>	<i>Marks.</i>
Prussia	226, 017, 302. 10	230, 200, 060. 10
Saxony	21, 247, 093. 40	22, 554, 093. 40
Bavaria		
Wurtemberg		
Baden	148, 536, 310. 00	141, 493, 552. 00
Hesse		
Elsass-Lothringen		
Total	395, 800, 705. 50	394, 247, 705. 50

Statistics are then given to show that the amount of silver coin now in circulation in Germany is not adequate to the demand, and England, where the silver in circulation amounts to 12s. per head, is referred to as a proof that Germany must add to her silver currency. The bill then calls attention to the safeguards against too large a supply of silver coinage, and adds that the proposed increase in the currency would give the wished-for opportunity to recoin the silver which has accumulated in the hands of the government since the suspension of the silver sales in May last and which now amount to 329,000 pounds (fine), and is valued at 31,000,000 marks. In conclusion, it is remarked that as the 5-mark notes do not seem to be appreciated by the public, it is proposed to reduce their circulation from 46,122,210 marks, at which amount it stood in the middle of last February, to 40,000,000 marks.

From all this it appears that the German Government is gradually reverting to an extensive use of the silver which in 1873 it was supposed to have permanently discarded.

I have, &c.,

AND. D. WHITE.

Synopsis of the portion of the eighth memorial (inclosure 11) relating to the silver coinage.

In 1879 there were withdrawn from circulation 9,146,183 one-thaler pieces (value in marks, 27,438,549). The presumable amount remaining to be withdrawn would be thus reduced to 323,714,782 marks, after deducting the loss in value at an average of 21 per cent.

The accounts of the sale of 6,725,117.608 pounds of fine silver were definitely settled December 31, 1878.

	Pounds.
The sales of 1879 amount to	377,744,712
Adding a quantity sent to the mint for coinage	32,429,569
Makes a total of fine pounds.....	7,135,291
The remelting having given	7,474,644
There would remain January 1, 1880	fine pounds.. 339,353
Adding the thalers remaining to be withdrawn at, say.....	fine pounds.. 3,583,000
The total quantity of silver to sell amounts to.....	fine pounds.. 3,932,353

Supposing that the average price of former sales can be realized, say 79.824 the fine pound, the net product would be 313,896,000 marks.

	Marks.
The 8th memorandum gives as the total loss on the sale of silver till December 31, 1879, a sum of.....	96,551,398.27
At the close of March, 1878, the loss was.....	75,401,608.67
Further difference to January 1, 1880	21,149,789.60
The sale of copper has caused a loss of	2,743,153.00
The general account of all operations shows an excess of expenses De- cember 31, 1879, of	43,889,231.22
This excess to April 1, 1878, was only	18,167,525.18
Difference January 1, 1880	25,721,706.04

These are the principal facts obtained from the 8th memorandum, especially those in regard to silver.

[Extracts from the report of Dr. Seetbeer to the German Commercial Association respecting German coinage.]

Execution of the coinage laws.

The statement placed before the Reichstags on the execution of the coinage laws from February 15, 1879, till February 16, 1880, contains the following among other things:

There were coined up to the end of 1879 of imperial gold coins—

	Marks.
Of double crowns.....	1,268,111,720
Of crowns	423,165,210
Of half-crowns	27,969,925
	1,719,246,855

The amount of the imperial silver coins which were put in circulation till the close of 1879 was—

	Marks.
In five-mark pieces.....	71,651,020.00
In two-mark pieces.....	98,804,578.00
In one-mark pieces.....	149,898,404.00
In fifty-pfenning pieces.....	71,485,889.50
In twenty-pfenning pieces.....	30,717,510.80
	422,557,402.30

There were coined of nickel and copper

44,756,274.72

All former coins of the separate States have been withdrawn, with the exception of part of the one-thaler pieces, at the close of 1879. There have been withdrawn from circulation by the empire—

	Marks.
Of gold coins of the single countries.....	90,959,896

Of silver coins of the single countries withdrawn up to the close of 1879: *

	Marks.
Thaler pieces.....	530,334,687.00
Other coins of the thaler system.....	339,621,180.42
Coins of other systems.....	210,530,270.96
Total.....	1,080,486,138.38

Of the silver coins withdrawn from circulation of the single countries, there have been used, up to the close of 1879, by melting and refining for the production of silver bars, 697,797,069.22 marks, which have produced 7,474,644.058 pounds of fine silver; from which it follows that the price of a pound of fine silver for the government was 93.35524 marks; of these silver bars there were sold to the close of 1879, 7,104,896 pounds of fine silver, which gave 567,139,993 marks or 79.824 marks for the pound fine. The loss caused by this transaction does not result entirely from the depreciation in the value of silver. Under this head are to be calculated 71,373,623.59 marks, while 23,838,611.56 marks must be calculated for the abrasion of the coins, and from the circumstance of their not having their full face value of metal, and 1,268,900.75 marks was covered by the gold and copper contents of certain coins. Of copper coins of the single States withdrawn there were 3,512,378.65 marks.

* * * There were probably in circulation in 1880 in Germany—

	Marks.	Per cent.
Imperial gold coins	1,400,000,000	50½
Former silver coins	460,000,000	16¼
Imperial silver coins.....	427,000,000	15½
Nickel and copper coin.....	40,000,000	14
Gold in bars and foreign coins	50,000,000	18
Paper money of the empire	2,377,000,000	850
Uncovered bank-notes (the whole circulation of the bank-notes 1,012,000,000) ..	160,000,000	57
	260,000,000	93
	2,797,000,000	

* * * We suppose that for 1880, 210,000,000 marks of imperial gold will be exported and melted. One hundred and twenty million marks are in the war treasury of the Empire. * * *

In 1870 the population of the North German Federacy and the Southern German States was in round numbers 39,500,000; for the middle of 1880 the population of the empire may be set down at 45,000,000, which makes for 1870 57.77 marks per capita; for 1880, 62.16 marks per capita.

Of these amounts, there were per capita in—

Year.	Gold.	Silver and fractional currency.	Uncovered paper money.
	Marks.	Marks.	Marks.
1870	2.81	41.54	13.42
1880	32.22	20.60	9.33

* * * The circulation of money in France (40,000,000 population, including Algiers), from the report of M. de Foville, to the close of 1878 was, in gold, 5,000,000,000 francs, and in silver, five-franc pieces 2,880,000,000 francs; (the uncovered bank-notes were about 135,000,000 francs.)

From this report it appears that the per capita sum in France nearly doubles that of the allowance in Germany.

* NOTE.—According to the resolution of the Bundesrath, of August, 1879, 5,000,000 marks of the 20-pfenning pieces were withdrawn, in order to be returned in 1 and 2 mark pieces. At the end of September, 1880, there were issued in imperial gold coins, 1,729,000,260 marks; imperial silver coins, 427,087,702 marks.

LATIN UNION.

FRANCE.

DEPARTMENT OF STATE,
Washington, October 22, 1880.

The Hon. JOHN SHERMAN,
Secretary of the Treasury:

SIR: Referring to your letter of the 17th of April last, asking this Department to make certain inquiries as to the coinage of certain countries therein named, and also referring to the reply of this Department thereto, dated the 14th of the same month, I now have the honor to transmit herewith a package of documents received from the French Government in response to the application made by this Department for information on the subject through the American legation at Paris.

I have the honor to be, sir, your obedient servant,

JOHN HAY,
Acting Secretary.

Inclosures.

1. A statement of the metallic currency coined in France, 1795 to December 31, 1879.
2. Law relative to the Monetary Convention of December, 1865.
3. Law of the year XI relative to the coinage of money.
4. A statement answering each of the interrogatories of the Treasury.

Reply to the request of the Secretary of the United States Treasury for information as to the amount of gold and silver coin, bullion, and paper money in France.

1st. The quantity of gold coined is 8,180,000,000; the cash reserve is given each week in the balance sheet of the Bank of France. The amount in circulation is unknown.

2d. The same reply with this difference, that there has been only 5,271,000,000 coined.

3d. There is no paper money in French circulation.

4th and 5th. There is scarcely any gold or silver production in France.

6th. Gold coinage (see accompanying table of coinage since 1795).

	Francs.
Importation: Gold, silver, bullion, 1879.....	339, 170, 000
Exportation: Gold, silver, bullion, 1879.....	424, 543, 000

Gold manufactured articles presented to the guaranty office:

	K.
1876.....	13, 406, 124
1877.....	13, 429, 857
1878.....	16, 275, 586
1879.....	12, 391, 975

7th. Silver coinage (see accompanying table of coinage since 1795):

Importation—Exportation: answered in previous question. Manufactured silver articles presented at the guaranty office:

	K.
1876.....	79, 093, 450
1877.....	76, 031, 983
1878.....	78, 185, 091
1879.....	73, 809, 372

As supplement to the above replies to the inquiries of the Secretary of the United States Treasury, the following additional data are given:

1st. The gold coins are in 100 francs, 50 francs, 20 francs, 10 francs, and 5 francs. The silver coins are 5 francs, 2 francs, 1 franc, 50 centimes, and 20 centimes. Bronze, 10, 5, 2, and 1 centimes. The unit of account is the franc.

2d. Gold and silver in the relation of 1 to 15.5, as fixed by the germinal law XI, which is still in force.

3d. The unlimited coinage of silver is suspended.

4th. The franc composed of 5 grammes of silver $\frac{9}{10}$ fine.

5th. Sending copy of the law on the subject.

COIN CIRCULATION.

The only coins which circulate in France that are not national are: 1st. Those of the Latin Union (Belgium, Switzerland, Greece, and Italy), with the exception of the subsidiary coins of the latter country since January 1st, 1880. 2d. The Austro-Hungarian gold coins of 4 and 8 florins, the gold coins of Monaco, of 20 francs and 100 francs. Foreign bronze coins are prohibited in France. The foreign coins which are in France, outside of the above-mentioned ones (the only coins foreign), that are received at the public offices and the Bank of France are so few in number that it would be impossible to make any estimate of them. As to the proportion in which foreign coins circulating in France are received by the public banks, the only information that can be given consists in the result of the inquiries made in 1878, and forwarded with the accompanying documents.

Statement of the nominal value of the gold coinage of France from 1795 to 1879, according to the decimal system of 1795.

Years.	100.	50.	40.	20.	10.	5.	Total.
Total from 1795 to Dec. 31, 1876, inclusive.....	44,346,400	46,568,700	204,432,360	6,708,899,220	1,013,641,610	233,440,130	8,251,328,420
1877.....				255,181,140			255,181,140
1878.....	1,281,400	264,700		183,772,000			183,318,100
1879.....	3,860,100			20,750,400			24,610,540
Total.....	49,487,900	46,833,400	204,432,360	7,168,602,800	1,013,641,610	233,440,130	8,716,438,200

Statement of the nominal value of the silver coinage of France from 1795 to 1879, according to the decimal system of 1795.

Years.	5 fr.	2 fr.	1 fr.	0.50 fr.	0.25 fr.	0.20 fr.	Total.
Total from 1795 to Dec. 31, 1876, inclusive.....	5,042,320,535	152,088,526	193,547,902	89,786,394	7,671,101.25	8,251,700.60	5,493,667,158.85
1877.....	16,464,285						16,464,285.00
1878.....	1,821,420						1,821,420.00
1879.....							
Total.....	5,060,606,240	152,088,526	193,547,902	89,786,394	7,671,101.25	8,251,700.60	5,511,952,863.85

Recapitulation table of coinage from 1795 to 1879.

Years.	Total coinage of gold and silver.
From 1795 to December 31, 1876.....	13,744,995,778.85
1877.....	271,645,425.00
1878.....	187,139,520.00
1879.....	24,610,540.00
Total.....	14,228,391,263.85

Yearly statement of the bronze pieces coined in France since the recoinage ordered by the law of May 6, 1852, to 1879—nominal value.

Years.	10 centimes.	5 centimes.	2 centimes.	1 centime.	Total.
1852 to 1876.....	33,156,437.60	26,372,667.60	1,838,646.52	1,137,517.43	62,505,268.95
1877.....	79,576.80	97,939.65	10,000.00	10,000.00	197,516.45
1878.....	25,000.00	23,300.00	22,250.00	17,889.50	88,439.50
1879.....	82,273.50	97,726.50	12,000.00	8,000.00	200,000.00
Total.....	33,343,287.90	26,591,633.75	1,882,896.52	1,173,406.93	62,991,224.90

Extracts from the report made for the commission empowered to examine the proposed law approved by the Monetary Convention, and of the arrangement relative to the execution of article 8 of this convention, signed at Paris November 5, 1878, between France, Belgium, Greece, Italy, and Switzerland, by M. Guyot, deputy (Rhône).

France cannot be expected to use silver, at least for several years to come. She has already in spite of herself taken more than her share. From 1872 till 1876 she has taken 837,500,000 francs, whilst India during the same period absorbed only 227,500,000 francs. From 1850 to 1868 France has exported one milliard four hundred millions of silver. At that time the return to par of the price of silver permitted her to resume the coinage of 5-franc pieces, which had been discontinued from 1856 to 1867 (ten years). The amount of silver 5-franc pieces existing in France then was estimated at one milliard and a half. Since 1867, inclusive, until the month of August, 1878, there were coined in 5-franc pieces 725,000,000; on the other hand, there existed at the Bank of France October 5, 1878, 270,000,000 of foreign 5-franc pieces against 682,000,000 of French pieces, say 40 per cent. The inquiry ordered by the minister on the number, denomination, and date of the pieces in the 19,511 cash offices of the financial administration resulted in finding 388,417 pieces of foreign 5 francs and 824,989 national pieces, say 46 per cent. The small difference is not surprising which exists between them, as we will show, as it is caused by the smaller sums in which silver is deposited at the cash offices than at the bank. The number of those making deposits is also relatively larger, so that some of them can make a sorting of coins, which would not be thought of by the usual customers of the bank. These 388,417 foreign pieces represent 1,942,085 francs, say two millions, which, added to the 270,000,000 of the bank, make 272,000,000. It may be estimated that there is at least as much held by individuals, as the circulation of silver is considerable at this time, and foreign coins would be found with them, as well as in the bank vaults, or in the cash offices, which would make 544,000,000 francs; pieces coined since 1867, 725,000,000 francs; approximate stock at that period, 1,500,000,000 francs; total, 2,769,000, from which must be deducted the millions sent to Germany, 239,000,000 francs; there would remain as valuation 2,530,000,000 francs of the actual stock.

The amount of five hundred and forty-four millions attributed to the sum of foreign coins is more likely to be below than above the truth, for from Italy alone there has been received since 1866 six hundred and seventy-five millions, of which a part has been returned, and another part has gone to Belgium and Switzerland.

From 1868 to 1877 the excess of our importations of silver over our exportations amounted to 1,239,000,000 francs; in 1876 the stock was already 1,500,000,000 francs; total, 2,739,000,000 francs.

It must be borne in mind that in this sum of one thousand two hundred and thirty-nine millions of silver is comprised the metal intended to be employed in the arts and manufactures. It will be seen that this total approaches very nearly that which we reached by a different system of investigations.

During the year 1878 there was admitted in silver-coin 121,543,400 francs; exported, 52,018,600 francs; remaining, 69,524,800 francs coined silver. In crude silver, in bulk or in ingots, there was imported 60,525,340 francs; exported, 8,621,300 francs; remaining, 51,904,040 francs.

Belgium has coined three hundred and fifty-five millions of silver coin since 1865, with one hundred and forty-five millions that it previously possessed, making five hundred millions of silver coin; though it is considerable, the amount of population being given, a minister of finance, M. Malon, has, however, stated that the actual circulation is not excessive; he has contended that the silver coins were not badly received by the public, and that if it had been otherwise it would have been shown by the increase of the metallic reserve in the banks. M. Malon was correct, but he might have added with no less reason that a considerable part of this silver coin was shipped into France, and that the Belgian circulation was so far relieved, for from 1874 to 1877, inclusive, Belgium has sent us two hundred and forty-two millions, payment for French exportations, and in 1878 forty-four millions more of silver; for the five years, two hundred and eighty-six millions. From the inquiry made August 14, 1878, it is found that silver represents 56 per cent. of the total circulation of Belgium, whilst in France the proportion is 26 per cent. However, more than half the monetary circulation of Belgium is composed of foreign coins, and the greater proportion of these foreign coins are French. Of twenty-five thousand seven hundred and ninety-four pieces of 20 francs found on the examination, sixteen thousand and thirty-two were French; of eight thousand three hundred and sixty-six gold 10-franc pieces, seven thousand nine hundred and ninety-three were French; and, lastly, of one hundred and fifty-two thousand nine hundred and fourteen silver 5-franc pieces, seventy-five thousand eight hundred and sixty-two were Belgian and seventy-one thousand nine hundred and seventy-three were French, which would prove that its metallic reserve of gold coins is insufficient, since 79 per cent. of its gold circulation

is furnished by France, although it does not form the one-half of its total circulation. Belgium should then purchase gold instead of silver.

Scandinavian states.—As the commercial relations of the Scandinavian states bring them in such close relations with England and Germany they ought not to delay in following the example of the latter. Fortunately, the circulation is too limited to have any very great influence on the market.

The unit is the kroner or crown, which is worth $\frac{1}{100}$ franc=1.338 franc; there are coined gold pieces of 20 and 10 crowns (kroner); silver pieces are of 1 and 2 kronen, 50, 25, and 10 öre (1 kroner=100 öre). Silver money is only considered subsidiary. No one is compelled to receive more than 20 kroners (27.76 francs). In all public offices gold will be given for subsidiary coins representing at least 10 crowns, or a multiple of that sum. In Norway the bank will purchase all gold ingots whose fineness is certified at 2,480 crowns per kilogram of fine gold, retaining $\frac{1}{2}$ per cent. for the melting. In reality, the bank alone coins money in Norway.

The Scandinavian states possessed July 1, 1878, in gold coin—

	Francs.
In Denmark.....	48,270,333
In Sweden.....	43,176,264
In Norway.....	13,106,458
	104,553,055

And in silver coin—

	Francs.
Denmark.....	25,205,875
Sweden.....	16,171,601
Norway.....	6,277,778
	47,655,254

The standard of fineness is $\frac{9}{10}$.

The fiduciary circulation for the three states amounts to 236,463,507 francs. Denmark has not imported silver since 1872, in conformity to the convention of March 27, 1873, between the three states. It has sold until 1876 21,250,000 francs of it.

In Sweden and Norway the substitution of gold for silver commenced in 1873. Norway has exported 25,000,000 of silver after having imported an almost equal sum of gold. Sweden has exported about 6,000,000, making for the three countries 50,000,000 in round numbers.

ITALY.

Table showing the amount of gold and silver coined under the metric decimal system in Italy.

Year.	Gold 900 fine.	Silver.			Total.
		5-lire.	Fractional.		
			900 fine.	900 fine.	
1803		49,735	7,155		56,890
1804		104,055	34,965		139,020
1805	16,760	57,280			57,280
1806	2,568,320	119,235	39,349.75		158,584.75
1807	195,080	196,385	35,889.25		232,274.25
1808	10,300,140	16,630,630	1,414,038.25		18,044,668.25
1809	2,668,760	13,596,955	1,553,635		15,150,590
1810	8,599,760	3,055,085	2,137,281.25		5,192,366.25
1811	5,731,660	17,640,110	3,824,507.25		21,434,617.25
1812	3,300,500	11,311,910	2,308,244		13,620,154
1813	3,037,220	5,567,150	3,440,214.50		9,007,364.50
1814	3,528,320	632,780	587,981.75		1,220,761.75
1815	4,717,700	468,220	658,171		1,126,391
1816	3,357,300	373,145	125,200		498,345
1817	7,227,660	868,180			868,180
1818	8,129,000	884,880			884,880
1819	5,329,600	325,660	98,544.75		424,204.75
1820	4,317,860	705,455			705,455
1821	4,720,480	290,780			290,780
1822	799,400	238,700			238,700
1823	1,034,300	177,160			177,160
1824	881,340	892,840	97,328		990,169
1825	3,547,180	42,059,580	915,939.50		2,975,519.50

Table showing the amount of gold and silver coined, &c.—Continued.

Year.	Gold 900 fine.	Silver.			Total.
		5-lire.	Fractional.		
			900 fine.	900 fine.	
1826	10, 178, 960	6, 983, 185	1, 844, 764. 50	.....	8, 827, 949. 50
1827	7, 299, 000	14, 306, 200	2, 431, 457. 50	.....	16, 737, 657. 50
1828	4, 415, 500	7, 009, 890	1, 339, 567. 50	.....	8, 349, 457. 50
1829	2, 451, 240	4, 544, 305	689, 003. 50	.....	5, 233, 308. 50
1830	3, 324, 540	10, 183, 290	1, 177, 694	.....	11, 360, 984
1831	3, 221, 040	2, 550, 130	298, 406	.....	2, 848, 536
1832	3, 657, 660	2, 176, 425	165, 215. 50	.....	2, 341, 640. 50
1833	3, 013, 610	1, 674, 230	41, 556. 25	.....	1, 715, 786. 25
1834	12, 795, 170	939, 535	70, 449	.....	1, 009, 984
1835	4, 638, 860	2, 026, 740	70, 329	.....	2, 097, 069
1836	2, 787, 830	3, 233, 765	81, 815. 50	.....	3, 315, 580. 50
1837	1, 840, 460	1, 972, 685	51, 584. 50	.....	2, 024, 269. 50
1838	3, 407, 760	1, 744, 560	51, 382	.....	1, 795, 942
1839	3, 221, 220	1, 731, 460	37, 082	.....	1, 768, 542
1840	4, 529, 980	1, 214, 370	.....	.....	1, 214, 370
1841	5, 973, 370	1, 639, 950	43, 804	.....	1, 683, 754
1842	2, 545, 970	1, 892, 010	30, 778	.....	1, 422, 788
1843	1, 587, 260	4, 120, 310	46, 462	.....	4, 166, 772
1844	1, 623, 900	6, 070, 390	148, 565	.....	6, 218, 955
1845	1, 678, 440	1, 723, 675	154, 031. 50	.....	1, 877, 706. 50
1846	1, 880, 350	1, 550, 470	61, 614	.....	1, 612, 084
1847	1, 697, 090	895, 070	45, 567	.....	940, 637
1848	2, 796, 780	4, 885, 590	33, 860	.....	4, 919, 450
1849	3, 391, 660	4, 207, 100	9, 355	.....	4, 216, 455
1850	4, 109, 100	3, 892, 790	16, 698	.....	3, 909, 488
1851	9, 175, 600	1, 828, 460	40, 106	.....	1, 868, 566
1852	2, 997, 500	2, 438, 410	135, 875. 50	.....	2, 574, 285. 50
1853	3, 593, 250	977, 270	64, 498. 50	.....	1, 041, 768. 50
1854	3, 777, 130	1, 790, 675	50, 936	.....	1, 841, 611
1855	3, 820, 600	680, 850	35, 278	.....	716, 128
1856	3, 516, 920	470, 835	74, 011	.....	544, 851
1857	2, 591, 290	270, 700	38, 988. 50	.....	309, 688. 50
1858	5, 604, 470	203, 005	20, 108	.....	223, 113
1859	12, 811, 500	302, 810	17, 047	.....	319, 857
1860	5, 992, 540	188, 130	5, 479, 280. 50	.....	5, 667, 410. 50
1861	3, 209, 410	979, 565	1, 412, 222. 50	.....	2, 391, 787. 50
1862	28, 698, 760	964, 435	.....	330, 960. 50	1, 295, 395. 50
1863	76, 514, 100	.....	.....	31, 751, 913. 20	31, 751, 913. 20
1864	12, 172, 600	601, 935	.....	30, 696, 351. 10	31, 298, 286. 10
1865	68, 705, 190	4, 010, 835	.....	41, 937, 106. 80	45, 947, 941. 80
1866	3, 926, 020	2, 351, 760	.....	35, 501, 070. 60	37, 852, 830. 60
1867	5, 525, 830	.....	.....	16, 530, 145. 80	16, 530, 145. 80
1868	6, 807, 940	.....	.....	1, 252, 452	1, 252, 452
1869	3, 707, 100	19, 976, 230	.....	.....	19, 976, 230
1870	1, 095, 400	30, 729, 280	.....	.....	30, 729, 280
1871	470, 160	35, 116, 695	.....	.....	35, 116, 695
1872	66, 100	35, 611, 920	.....	.....	35, 611, 920
1873	20, 404, 140	42, 273, 935	.....	.....	42, 273, 935
1874	5, 919, 420	60, 000, 000	.....	.....	60, 000, 000
1875	2, 244, 440	50, 000, 000	.....	.....	50, 000, 000
1876	2, 154, 568	36, 000, 000	.....	.....	35, 000, 000
1877	4, 947, 960	18, 000, 000	.....	.....	18, 000, 000
1878	6, 345, 280	9, 000, 000	.....	.....	9, 000, 000
1879	2, 929, 320	20, 000, 000	.....	.....	20, 000, 000
	491, 009, 620	543, 681, 770	33, 557, 842	156, 000, 000	733, 239, 612

Copy of the note of the minister of agriculture, industry, and commerce, dated October 29, 1879. No. 13,030 gives information as to the amount of gold and silver in Italy, as reported by the minister of finance, in reply to letter of July 31, 1879.]

It is impossible to reply with entire certainty to all the inquiries of the ministry as to the quantity of gold and silver or ingots supposed to be in circulation in the Kingdom of Italy, the production of the mines, and the annual consumption in the arts and manufactures.

The reserve in gold and silver in the treasury, with which is included that of analogous institutions, amounts to a sum total of about 120,000,000 of lire.

As to the reserve of gold and silver existing outside of the treasury, it would be impossible to furnish any positive information; even an estimate would have a purely hypothetical character.

If an amount should be required (taking into consideration all the researches made

as to the approximate issue) of the reserve held by individuals and of the reserves of bank issues, it may be placed at something more than 100,000,000 of lire; making the total of gold and silver coin existing in Italy to be about 300,000,000 lire.

As regards the production of the gold and silver from our mines, it may be stated that for the three years from 1875-'77 the production of gold and silver has been as follows:

1875.....	£80,000
1876.....	286,000
1877.....	375,000

The production of silver in Tuscany has been for—

1875.....	£131,000
1876.....	92,000
1877.....	93,000

It would be impossible to furnish any approximate estimate of the annual consumption of gold and silver in the arts and manufactures.

The above is all the information that we have in our possession to transmit to the minister in answer to the inquiries.

For the minister.

SANTA AMEDIE.

Translation of a note from the Italian ministry of foreign affairs, to accompany dispatch No. 857.

ROME, December 3, 1879.

M. MINISTER: Referring to your esteemed note of the 9th of last June, I have the honor to inclose to you herewith some documents which are intended to reply to three of the interrogations submitted by the American Government to that of the King, in view of certain determinations which that government intended to take as soon as possible in relation to the circulation of paper money.

As to the quantity, at the present time in circulation, of this paper money, it amounted on the 30th of last September to 1,636,211,215 lire, that is, 940,000,000 of lire (francs) in notes of the association (government and associated banks), and 696,211,215 lire (francs) in notes of the institutions (authorized) to issue them.

I beg you, M. Minister, to accept the assurance of my high consideration.

For the Minister.

A. PEIROLORI.

M. PERKINS MARSH,
Minister of the United States, Rome.

Italian coinage from 1862 till 1878.

Years.	Gold—	Silver.		Remarks.
	Of 1000.	Of 1000.	Of 1000.	
	Pieces of 100, 50, 20, 10, 5 lire.	Pieces of 5 lire.	Pieces of 2 and 1 lire—50 and 20 cents.	
1862.....	£28,608,760	£964,435	£330,960.50	From 1874 the circulation of 5-lire pieces was annually limited.
1863.....	76,514,100	.....	31,751,913.20
1864.....	12,177,600	601,935	30,696,351.10	
1865.....	68,705,190	4,010,835	41,937,106.80	
1866.....	3,926,020	2,351,760	33,501,070.60	
1867.....	5,525,830	16,530,145.80	The circulation of silver coins of 1000 is limited.
1868.....	6,807,940	.....	1,252,452
1869.....	3,707,100	19,976,230	.....
1870.....	1,095,400	30,729,280	.....
1871.....	470,160	35,216,695	.....
1872.....	66,100	35,611,920	
1873.....	20,404,140	42,273,935	.....
1874.....	5,919,420	60,000,000	.....
1875.....	2,244,440	50,000,000	.....
1876.....	2,154,560	36,000,000	.....
1877.....	4,947,960	18,000,000	
1878.....	6,345,280	9,000,000	
Total.....	249,615,000	344,637,925	156,000,000	

SWITZERLAND.

Reply to questions asked by the ambassador from the United States in relation to the Swiss coinage.

Answer to first question. I have the honor to inform you that your request for a copy of the mint laws in regard to the coinage has been received, but at present we have no printed copy on hand.

Second. Statement showing amount of each kind and denomination coined since 1800, or for as long a period as practicable. I have inclosed the whole result since the establishment of the mints in 1850 till the close of the year 1879, in which all the desired information will be found.

Third. Any information obtainable concerning the manufacture, fineness, weight, or legal-tender quality of coins. It is to be observed that in silver coins exclusively the fineness is that fixed by the Latin Mint Convention, $\frac{835}{1000}$, and the five-franc piece at $\frac{900}{1000}$ fine, used in commercial relations. All other silver coins have been called in and withdrawn from circulation.

All coinage of Swiss coins takes place under the management or control of the state, under the direct supervision of the Swiss financial department, to whom is also given control over all coin heretofore coined.

Gold coins have only been coined in Switzerland as an experiment. Switzerland does not have any gold coin.

The billon coinage.—These coins were formerly coined in an alloyage formed of the four metals—silver, copper, nickel, zinc—in the following proportions:

	20 rappen.	10 rappen.	5 rappen.
Silver	150	100	50
Copper	650	650	650
Nickel	100	100	100
Zinc	100	150	200
Total	1,000	1,000	1,000

In the 10 and 5 rappens of the coinage of 1879 the alloyage is changed, and is coined from metal consisting of nickel, 25 per cent., new alloyage; copper, 75 per cent., new alloyage. The copper coins are coined from copper with the addition of zinc. The following table gives the relative proportions of each coin:

5 frs.	2 frs.	1 fr.	$\frac{1}{2}$ fr.	20 cs.	10 cs.	5 cs.	2 cs.	1 c.
25 grs.	10 grs.	5 grs.	2.5 grs.	3.25 grs.	2.5 grs.	1.66 grs.	2.5 grs.	1.5 grs.

The pieces of 10 centimes and 5 centimes will also be coined in somewhat different proportions in the new alloyage.

The ten-rappen pieces = 3.000 gr. instead of 2.5 gr.

The five-rappen pieces = 2.000 gr. instead of 1.66 gr.

In answer to the inquiry as to the value of the Swiss money as legal tender, it may be stated that all the different coins of Switzerland are lawfully legal tender, with the exception of those coins which, by special order, have been withdrawn from circulation. The largest or smallest amount in which payments can be made in the different kind of coin is accurately shown in the accompanying mint laws of May 7, 1850. The worn-out Swiss coins are called in and remelted. The depreciation in consequence of loss in weight while in circulation will, according to the law, be borne by the state. For this purpose there exists a separate fund, called the mint reserve fund. This fund is, on the other hand, reimbursed by the gain made by the new coinage.

Fourth question. No answer can be given at this time to the above question, as the necessary information cannot be obtained. The above are, as far as possible, the answers requested in regard to the mints and coinage.

EDMUND PTAHLIN,
Mint Director.

BERNE, May 7, 1880.

Summary of the coinage of the Swiss mints from the year 1850 to the end of 1879.

SILVER.

Value.	Fineness.	Number of pieces.	Nominal value.
			<i>Francs.</i>
5 francs	900-1,000	2,095,650	10,476,250
2 francs	900-1,000	2,500,000	5,000,000
1 franc	900-1,000	5,750,000	5,750,000
$\frac{1}{2}$ franc	900-1,000	4,500,000	2,250,000
2 francs	800-1,000	3,500,760	7,001,520
1 franc	800-1,000	3,517,558	3,517,558
2 francs	835-1,000	4,000,000	8,000,000
1 franc	835-1,000	6,055,500	6,055,500
$\frac{1}{2}$ franc	835-1,000	4,000,000	2,000,000
Total			50,052,828

BILLON.

20 centimes	Old alloyage.	15,883,608	3,176,721.60
10 centimes	do	17,694,848	1,769,484.80
5 centimes	do	26,524,566	1,326,228.30
Total			6,272,434.70
10 centimes	New alloyage.	1,000,000	100,000
5 centimes	do	1,000,000	50,000
Total			150,000

COPPER.

2 rappen		14,513,300	290,266
1 rappen		23,053,997	230,539.97
Total			520,805.97

AUSTRIA.

LEGATION OF THE UNITED STATES, *Vienna, July 6, 1880.*

SIR: It is only a few days ago that I received, in answer to a former request, from the Servian minister in Vienna a memorandum (in German) embracing the statistics which are reported in this dispatch, and which are now translated and transmitted for the use of the Treasury Department in obedience to your circular of the 11th of February, 1880.

1st. To the first inquiry, his excellency promises me a copy (in French) of the mintage law of Servia, as adopted on the 10th of December, 1878, but he has not yet received it from his government. When it shall be received I will forward it.

2d. This statement respecting the coinage presents the following facts:

Prior to 1868 Servia had no coinage of its own. In that year they caused to be minted copper coins, respectively, equal in value to 10, 5, and 1 centimes ("paras"), to the value in all of 600,000 francs ("dinars"). In the year 1875 they caused to be minted silver pieces of 2, 1, and $\frac{1}{2}$ dinars (francs) to the value in all of 6,000,000 dinars (francs).

According to the law of the 10th December, 1875, there were to be thereafter minted as follows:

	Dinars.
250,000 coins of gold, at 20 dinars (francs)	5,000,000
500,000 coins of gold, at 10 dinars (francs)	5,000,000
200,000 coins of silver, at 5 dinars (francs)	1,000,000
750,000 coins of silver, at 2 dinars (francs)	1,500,000
800,000 coins of silver, at 1 dinar (francs)	800,000
600,000 coins of silver, at $\frac{1}{2}$ dinar (francs)	300,000
9,000,000 coins of copper, at 10 paras (centimes)	900,000
6,000,000 coins of copper, at 5 paras (centimes)	300,000
Authorized amounts in all	14,800,000
Prior mintage in silver	6,000,000
Prior mintage in copper	600,000

Total coinage now provided for by law..... 21,400,000

Very small amounts of gold coins, however, have yet appeared.

3d. The fineness and descriptions of both gold and silver coins correspond exactly with the fineness and descriptions of the like French coins, substituting only dinars for francs and paras for centimes.

Servia having no mint of its own has procured its mintage to be done at Paris and Vienna. [Query: Could not the United States advantageously offer to do the mintage, especially in silver?]

The metrical-decimal system of the "Latin Union" has been by law adopted for the coins of Servia. The minister was unable to inform me respecting the legal-tender quality of the respective coins; I have requested further information on that point.

4th. The coins of both gold and silver from the mints of Austria, France, Italy, Switzerland, Belgium, Greece, Roumania, Germany, England, Russia, and Turkey circulate to some extent in Servia. The most abundant, however, are the gold coins of Austria-Hungary, known as ducats (for value, &c., see Inclosure III to my dispatch No. 299).

After these come the gold coins of France, Italy, and Belgium, and then those of the other countries named, in less quantities.

5th. Paper money does not exist in Servia.

I have the honor to be, sir, your most obedient servant,

JOHN A. KASSON.

The Hon. WILLIAM M. EVARTS,
Secretary of State, Washington, D. C.

LEGATION OF THE UNITED STATES,
Vienna, August 12, 1880.

SIR: Referring to your dispatch No. 108, I beg to advise the receipt to-day of a supplementary response of the Austrian and Hungarian ministries of finance, to the application of this legation for the information desired by the Secretary of the Treasury, at Washington. I inclose copy of the response with translation.

In the statement the translation appears in red ink, and I send the original, retaining a copy in the legation.

I have the honor to be, sir, your most obedient servant,

J. F. DELAPLAINE.

Hon. WM. M. EVARTS,
Secretary of State, Washington.

[Translation.]

By note of 8th June of last year, the envoy extraordinary and minister plenipotentiary of the United States of America, Mr. John A. Kasson, was pleased to apply to the imperial royal minister of finance for information relative to the quantity of gold and silver obtained in Austria-Hungary, and coined in the mint.

At the desire of the said ministry and on the basis of the data delivered by the same in conjunction with the Hungarian ministry, this ministry for foreign affairs now has the honor to communicate to the envoy that, in the year 1879, the production of the precious metals in the kingdoms and the provinces represented in the Reichsrath amounted to 17 kilograms of gold and 29,534.7 kilograms in silver, while in Hungary 1,581 (1,949) kilograms of gold and 18,645 (5,813) of silver.

As to the quantity, the kind, and the value (in Austrian currency) of the money coined in Austria (Vienna) and Hungary (Kremsnitz), the appended statement affords the desired information.

The undersigned avails himself of this occasion to renew to the envoy the assurance of his distinguished consideration.

Vienna, August 10, 1880.

For the minister for foreign affairs.

KALLAY.

Mr. JOHN A. KASSON,
Envoy Extraordinary and Minister Plenipotentiary of the United States of America.

Statement of the gold and silver pieces of money coined in the year 1879 in the Austrian and Hungarian mints (Vienna and Kremnitz).

Mints	Gold coins.				Total.
	Francs.		Ducats.		
	Twenty-franc.	Ten-franc.			
Vienna.....	<i>Francs.</i> 349,482.60	<i>Francs.</i>	<i>Francs.</i> 561,504	<i>Francs.</i> 1,735,468.80	<i>Francs.</i> 2,648,455.40
Kremnitz.....	2,475,530.10	50,086.35	.....	17,524.80	2,543,141.25
Total.....	2,825,012.70	50,086.35	561,504	1,752,993.60	5,189,596.65

Mints.	Levant thalers.	Silver coins.		Total.	Total coinage.
		Florin pieces.			
Vienna.....	<i>Francs.</i> 2,339,466.39	<i>Francs.</i> 1,102,086	<i>Francs.</i> 37,485,342	<i>Francs.</i> 38,587,428	<i>Francs.</i> 43,573,349.79
Kremnitz.....	.....	.....	25,755,927	25,755,927	28,299,068.25
Total.....	2,339,466.39	1,102,086	63,241,269	64,343,355	71,872,418.04

[Translation.]

In Austria-Hungary at the present time exist two mints: The Imperial Royal Chief Mint at Vienna for Austria, and the Royal Hungarian Mint at Kremnitz for Hungary. All the other formerly existing mints have been abolished.

The legal standard (*gesetzliche Währung*) is the so-called "Austrian standard" (*Oesterreichische Währung*), in pursuance of the coinage convention of the 24th January, 1857, (imperial patent of 19th September, 1857, and of 27th of January, 1858), namely, the 45 florin basis, according to which 45 single florins are coined from the mint pound = 500 grams fine silver.

Conformably to the same coinage convention, the coinage of the ducal and of the Levantine thaler (Maria Theresa thaler) as trade coins is further allowed. Accordingly, the ducat pursuant to the former coin ordinance of the Emperor Ferdinand I, of the year 1859 (67 pieces from the rough old Cologne mark $23\frac{3}{4}$ carats fine), and the Levantine thaler (always with the same year's date, 1780), alike with the earlier conventions = thaler pursuant to the convention of the 21st of September, 1873, are continuously coined. In Hungary these Levantine thalers are not coined.

There are to be further specified gold coins of 8 and 4 florins (=20 and 10 francs) in weight, size, and alloy, like the similar French coins, in conformity with the law of March 9, 1870; in Hungary in conformity with Article XII of the law of the year 1869.

In conclusion, of silver fractional coins exist pieces of 20 and 10 new kreuzers, in conformity with the law of July 1, 1868, on the 75 florin basis (75 florins in fractional coin from one mint pound of fine silver).

As to copper fractional coins, there are pieces of 4, 1, and $\frac{1}{2}$ kreuzers, in conformity with the coinage convention, namely, 1 florin 50 kreuzers from the mint pound of copper.

Accordingly the present coinage consists of the following classes of coin :

Denomination of coins.	Rough weight.	Fineness in thousandths.	Fine weight.	Coined pursuant to law of—
I.—GOLD COINS.				
	<i>Grams.</i>	<i>Grams.</i>	<i>Grams.</i>	
Ducats, { Single	3.4909	986	3.4424	} Mint ordinance of Emperor Ferdinand I, of the year 1559. } Law of March 9, 1870.
Quadruple	13.9636	986	13.7696	
Eight florins=20 francs	6.4516	900	5.8065	
Four florins=10 francs	3.2258	900	2.9032	
II.—SILVER COINS.				
Two-florin pieces	24.6914	900	22.2222	} Coinage convention patent of September 19, 1857. } Convention of year 1753.
Florin pieces	12.3457	900	11.1111	
Levantiner thaler	28.0668	833.33	23.3890	
III.—SILVER FRACTIONAL COINS.				
Pieces of 20 new krenzer	2.6667	500	1.3333	} Law of July 1, 1868.
Pieces of 10 new krenzer	1.6667	400	0.6667	
IV.—COPPER COINS.				
Pieces of 4 new krenzer	13.333	.....	.....	} Law of July 1, 1868. } Patent of September 19, 1857.
Pieces of 1 new krenzer	3.333	.....	.....
Pieces of $\frac{1}{2}$ new krenzer	1.666	.....	.....

The union coins (*Vereins münzen*) in conformity with the coinage convention of January 24, 1857, namely, the gold crown and the vereinsthaler (single and double), as well as the $\frac{1}{2}$ florin piece and the convention fractional coins of 10 and 5 new kreuzers, are no longer coined.

J. MÜLLER.

NETHERLANDS.

LEGATION OF THE UNITED STATES,
The Hague, March 17, 1880.

SIR: I have the honor to acknowledge the receipt of your "special and separate" of the date of February 11, 1880, in which are set forth certain interrogatories to which the honorable the Secretary of the Treasury desires answers for the information of his department.

Immediately upon its reception I addressed a note to the minister of foreign affairs, making known the request, and inclosing for him a copy of the "special." As the minister will refer my communication to the department of finance, some time will probably pass before I am favored with an answer. As delay may not be convenient to the honorable Secretary of the Treasury, I have concluded to give you such facts, imperfect though they may be, as I gathered when trying to obtain material for my answers to former dispatches. So soon as the minister of finance shall reply through the foreign office to my note I will transmit the correspondence, which no doubt will supply any omission in this communication.

In answer to the first interrogatory, asking for a copy of all existing laws authorizing the coinage of money, I inclose the two I have: the first enacted on the 26th of November, 1847, marked 69, and the law passed June 6, 1875, numbered 117.

To the second, asking a statement showing amount of each kind, denomination, coined since 1830, the extent of my definite information is contained in my dispatch No. 123, of 19th September, 1879, and published on page 82 of the Report of the Director of the Mint for the fiscal year ending June 30, 1879. Reference may also be had to my dispatches Nos. 19 and 21. The showing from the minister of finance here will doubtless embrace many preceding years.

To the third, asking any information obtainable concerning the manufacture, fineness, weight, or legal-tender quality of the coins, I reply that the guilder silver is 0.9450 gram fine silver; 0.945 gram intrinsic value; (?945 fine) 10 grams, weight. The ten guilder gold is 0.6048 gram fine gold in the guilder; 0.9000 gram intrinsic value; (?900 fine) 6.720 grams, weight.

To the fourth, asking "to what extent are the coins of other countries in circulation," I reply, to no extent.

To the fifth, asking for a copy of any law authorizing the issue of paper money either by the government or by the banks, I reply by inclosing an act of Parliament passed on the 26th of April, 1852, No. 90. As to legal-tender, that quality has not been given to paper; no person is compelled to receive it; everybody may reject but the government; that receives it in payment for all dues, and in practice everybody is willing to take it, for it is preferable to gold. As to the amount of such paper, 10,000,000 of guilders, in denominations from 1,000 francs to 10 francs, have been issued. This is secured by a deposit of 18,788,000 francs nominal in government stocks, bearing interest at rate of $2\frac{1}{2}$ per cent.

The money in circulation is chiefly silver. The coinage of silver is restricted. It is in the power of government at any time to arrest it. The coinage of gold is unrestricted. Silver, gold, paper money, and bank notes are at par.

I am, sir, your obedient servant,

JAMES BIRNEY.

Hon. WM. M. EVARTS,
Secretary of State.

LEGATION OF THE UNITED STATES,
The Hague, June 4, 1880.

SIR: I have the honor to acknowledge the receipt of your circular, marked "Separate," bearing date April 30, 1880, in which are propounded by the honorable Secretary of the Treasury certain interrogatories in regard to the finances of the Netherlands.

The first seven questions of the Secretary are identical with those set forth in a similar request in your No. 106 of May 23, 1879, and were fully answered in my No. 123, inclosing the reply of the minister of finance, and which has been published in the Report of the Director of the Mint for the fiscal year ending June 30, 1879. The circular appends five other interrogatories, which were in part replied to in my Nos. 144 and 147, in answer to special of February 11 last. They may be replied to in full as follows: To the first, viz:

What are the standard coins in circulation, and what denomination of coin is the unit of the money of account of the country to which you are accredited?

Answer. Gold equal to 10 guilders; silver equal to $2\frac{1}{2}$ guilders; silver equal to 1 guilder; silver equal to $\frac{1}{2}$ guilder. The guilder or florin is the unit of the money of account.

Second question. What is the legal standard of value, gold or silver?

Answer. Gold and silver. Gold became standard in 1875. Silver no longer coined. The guilder in gold contains 0.6048 pure. The guilder in silver contains 9.450.

Third question. What is the ratio of the two metals in the coinage?

Answer. The ratio is 15.625 silver to 1 gold.

The fourth is answered thus: The weight of the silver guilder is 10 grams; finesnes $\frac{945}{1000}$. The laws asked for in No. 5 were inclosed (Nos. 144 and 147.)

I am, sir, your obedient servant,

JAMES BIRNEY.

Hon. WM. M. EVARTS,
Secretary of State.

SCANDINAVIAN COUNTRIES.

DENMARK.

MINISTRY OF FINANCE,
Copenhagen, March 15, 1880.

In returning herewith the note, with inclosure, from the chargé d'affaires of the United States in this city, which the ministry for foreign affairs had the goodness to send to this ministry, according to which note and inclosure the Government of the United States desires to be furnished with answers to a series of questions specifically formulated in the said inclosure, relating to the finances of Denmark, the ministry of finance take pleasure in communicating the following answers to the said questions:

1. Herewith inclosed, please find a copy of the coinage law of May 23, 1873, which is still in force, together with a copy of a coinage convention concluded between Denmark and Sweden of May 27, 1873, which convention Norway also adopted October 16, 1875.

2. After the former silver coinage law had been supplanted by the coinage law of May 23, 1873 (in force since January 1, 1875), according to the provisions of which gold became the basis of the new money-system in Denmark, the old coins were called

in and exchanged for the new crown-coins. The amount of money coined from the time the change in the money-system took place to March 31, 1879, is as follows:

	Crowns.
In gold (in 10 and 20 crown pieces).....	34,754,640 00
In silver (in 25 and 10 öre pieces and crown pieces).....	18,148,229 80
In bronze (in 1, 2, and 5 öre pieces)	489,991 45

3. The information here requested is contained in the first eight paragraphs of the new coinage law referred to above.

4. Swedish and Norwegian coins, coined in accordance with the coinage convention above referred to, are legal tenders in Denmark.

5. The National Bank of Copenhagen, a private corporation, and entirely independent of the ministry of finance, has the sole monopoly in Denmark of issuing bank notes possessing the character of legal tender. The bank is authorized to issue bank notes to such an amount as may be required by the necessities of trade, provided it possesses—

1. A metallic reserve, the value of which may be exceeded by 30,000,000 crowns of the actual amount of bank notes in circulation, but which shall, in no case, be less than three-eighths of the entire volume of bank notes.

2. Solid bonds, &c., of an actual value one and a half times as large as that portion of the bank notes in circulation not covered by the metallic reserve. The amount of such bank notes in denomination of 10, 50, 100, and 500 crowns in circulation on February 23, 1880, is 58,721,390 crowns; amount in bank, 12,278,610 crowns; total amount of bank notes issued, 71,000,000 crowns.

These bank notes are redeemable by the national bank at any time in gold at par.

M. I. CRAMER,

United States Chargé d'Affaires.

SWEDEN AND NORWAY.

Gold and silver in Sweden.

GOLD.

Years.	Received from the mines.	Imported, in coin.	Imported, in ingots.	Used for arts and industry.	Coined.	Exported, in coin.	Exported, in ingots.	Amount in treasury and banks.
	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.
1870.....	9	415	420	136	88	1		411
1870.....	10	97	35	141		3		386
1871.....	6	99	635	171	14			962
1872.....	6	949	1,466	215	34			2,684
1873.....	5	2,049	1,338	265	928			6,014
1874.....	3	1,448	2,841	318	3,643	814		6,406
1875.....	4	852	2,151	811	3,052	1,066		7,997
1876.....	6	737	2,361	345	2,619	504		7,783
1877.....	4	262	1,152	823	1,726	29	10	7,218
1878.....		1,253	1,777	264	1,976	302		6,072

As nearly as can be calculated, there must have been in the beginning of 1878 about 5,500,000 crowns gold in circulation in the country.

SILVER.

Years.	Received from the mines.	Imported, in coin.	Imported, in ingots.	Used for arts and industry.	Coined.	Exported, in coin.	Exported, in ingots.	Amount in treasury and banks.
	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.	Kilos.
1869.....	1,235	1,327	13,373	2,025	8,141	5,966	10,814	56,208
1870.....	1,190	7	9,619	2,237	4,360	5,899	627	56,340
1871.....	974	8,645	19,159	2,531	9,973	12,324	157	72,144
1872.....	742	36	23,953	2,871	76	528	43	97,290
1873.....	705	18,651	1,109	3,137	1,463	12,599	6,204	86,616
1874.....	739	1,557	2,336	3,510	4,738	15,150	23,888	63,432
1875.....	736	6,274	1,627	3,061	29,492	862	8	59,430
1876.....	797	4,177	1,539	3,176	23,719	5,400	8,536	23,652
1877.....	850	53	954	2,812	7,093		34	23,546
1878.....		284	1,044	2,199	4,539	90	255	31,224

As nearly as can be calculated, the amount of silver coin in circulation in the country at the beginning of 1878 was 11,000,000 crowns.

No gold is produced in Norway. The quantity of silver from Königsberg silver mine—the only silver mine in Norway—was from 1858 to 1878, as follows:

Kilograms.		Kilograms.	
1858.....	4,970	1863.....	3,835
1859.....	4,818	1869.....	3,680
1860.....	4,259	1870.....	3,585
1861.....	3,469	1871.....	3,457
1862.....	3,091	1872.....	3,703
1863.....	3,216	1873.....	3,558
1864.....	3,053	1874.....	3,348
1865.....	3,682	1875.....	4,057
1866.....	3,498	1876.....	4,067
1867.....	3,487	1877.....	4,524

The coinage of gold commenced in 1874. There has been coined in—

Kilograms.		Kilograms.	
1874.....	1,696	1877.....	391
1875.....	847	1878.....	1,120
1876.....	882		

The amount of gold used in arts and industry from 1870 to 1878, as follows:

Kilograms.		Kilograms.	
1870.....	20	1875.....	29
1871.....	18	1876.....	22
1872.....	21	1877.....	24
1873.....	20	1878.....	21
1874.....	28		

It may be remarked here that a considerable portion of the gold articles sold in Norway is imported ready made, and is not included in the above estimate. The amount of silver coined from 1862 to 1878 is as follows:

Kilograms.		Kilograms.	
1862.....	2,242	1872.....	648
1864.....	3,063	1873.....	1,584
1865.....	2,765	1874.....	1,200
1867.....	1,696	1875.....	6,600
1868.....	2,126	1876.....	6,280
1869.....	1,703	1877.....	8,572
1870.....	360	1878.....	4,147
1871.....	1,262		

In the above coinage estimate were included about 14,700 kilograms manufactured from old coins melted. The amount of silver used in art and industry from 1870 to 1878, is as follows:

Kilograms.		Kilograms.	
1870.....	1,400	1875.....	2,200
1871.....	1,340	1876.....	1,700
1872.....	1,580	1877.....	1,680
1873.....	1,940	1878.....	1,400
1874.....	2,440		

The information in regard to the importation and exportation of gold and silver which we are able to give is far from satisfactory, partly because we cannot distinguish between gold and silver, partly because the custom-house report of this question of foreign trade has shown itself to be unreliable. The following estimates are taken from the official table of commercial statistics, which gives our exportation and importation of gold and silver in the form of coin and ingots. It must therefore be used with care.

IMPORTED SILVER.

Crowns.		Crowns.	
1866.....	630,000	1869.....	2,432,000
1867.....	1,344,000	1870.....	1,425,000
1868.....	1,193,000	1871.....	4,947,000

EXPORTED SILVER.

1866.....	402,000	1870.....	34,000
1867.....	181,000	1871.....	30,000
1868.....	1,142,000	1872.....	284,000
1869.....	506,000	1873.....	14,997,000

IMPORTED GOLD.

	Crowns.		Crowns.
1872.....	3,202,000	1876.....	768,000
1873.....	15,346,000	1877.....	1,306,000
1874.....	3,238,000	1878.....	3,646,000
1875.....	118,000		

EXPORTED GOLD.

1874.....	27,000	1877.....	5,000
1875.....	2,807,000	1878.....	568,000
1876.....	788,000		

Any reliable information as to the importation and exportation of gold and silver in other forms than as coins and ingots cannot be given.

Dated at the finance and customs department, Christiania, September 22, 1879.

DEPARTMENT OF FOREIGN AFFAIRS,
Stockholm, May 28, 1880.

MR. MINISTER: In conformity to the desire which you expressed to my predecessor, I have the honor to transmit to you the annexed copy which my colleague, the minister of finance, has addressed to me in response to the first part of the questions presented by your note of March 25. In the table likewise subjoined you will find as much information as can be obtained relative to the remainder of the questions.

By your note of May 25 you further request later data to those which are found in the papers inclosed in the communication of the minister of foreign affairs dated October 7, 1879. I will reply to your request of May 25, when I shall have received from the proper source the necessary information.

You have also asked to be informed on certain points which coincide with the requests expressed by your communication of March 25, and to which you will find responses in the table annexed to the copy of the communication before cited of the minister of finance.

I will add solely for a *résumé* that gold is the standard of the United Kingdoms, that the monetary unit is one crown, that 124 pieces of gold of 20 crowns or 248 pieces of 10 crowns contain in all one kilogram of fine gold, which is consequently of the value of 2,480 crowns; that there is not a fixed tariff for the relative value of gold and silver. Gold coin alone is legal tender to an unlimited extent, and silver coins serving only as change, not having an intrinsic value corresponding to the amount which they represent.

I improve this occasion to offer to you, Mr. Minister, the assurances of my most distinguished consideration.

(Signed)

HOCCHILD.

UNITED STATES LEGATION,
Stockholm, October 12, 1880.

SIR: Accompanying my dispatch 75, of May 27, I forwarded papers containing information asked by the Secretary of the Treasury touching gold and silver and other circulating medium, and coinage of gold and silver in Sweden.

Herewith I send additional data, just received through the minister of foreign affairs, touching the gold, silver, and paper circulation of 1879, the most recent reliable information this government is able to furnish.

I have the honor, sir, to be your obedient servant,

JOHN L. STEVENS.

Hon. W. M. EVARTS,
Secretary of State.

QUANTITY OF GOLD IN SWEDEN.

Description.	1878.	1879.
Received from the mines.....kilograms.....	9	3
Imported:		
Coined.....do.....	1,253	4,175
In ingots.....do.....	1,777	1,075
Used for the arts, &c.....do.....	264	217
Coined.....do.....	1,976	606

QUANTITY OF SILVER IN SWEDEN.

Description.	1878.	1879.
Received from the mines.....kilograms..	1, 268	1, 502
Imported:		
Coined.....do.....	234	500
In ingots.....do.....	1, 044	486
Used for the arts, &c.....do.....	2, 199	1, 565
Coined.....do.....	4, 539	464

Amount of gold in 1879 exported.—Coined in 1879, 443 kilograms; 1878, 302 kilograms; coin in state treasury and banks at end of 1879, 8,552 kilograms; in 1878, 6,072 kilograms. In circulation probably no particular change has taken place since the end of 1878, when it was estimated at 5,500,000 kronors.

Amount of silver in 1879 exported.—Coined in 1879, 447 kilograms; in 1878, 90 kilograms; 1879, in ingots, 15 kilograms; 1878, 255 kilograms; silver coin in the state treasury and banks at the end of 1879, 35,275 kilograms; in 1878, 31,224 kilograms. In circulation probably no particular change has taken place since the estimate at the close of 1878, when the total amount was 11,000,000 kronors.

Amount of bank notes in circulation at the end of 1879, 80,811,090 kronors; at the end of 1878, 72,785,000 kronors.

PORTUGAL.

LEGATION OF THE UNITED STATES,
Lisbon, June 26, 1880.

SIR: With respect to your instructions marked separate, dated April 30, requesting me to furnish for the use of the honorable Secretary of the Treasury all the information obtainable in reference to the amount of gold and silver coin, bullion, and paper currency in Portugal, I have the honor to submit the following replies to both series of interrogatories on the subject propounded by the Secretary of the Treasury. To the first series:

1. Amount of coin in the various banks of the kingdom December 31, 1878, 8,803,860 milreis. The Bank of Portugal is the financial agent and depository for the government funds. No return is made of the amount of gold and bullion in the treasury.

2. No distinction made in returns between gold and silver.

3. On the 31st of December, 1878, 4,651,480 milreis. No labor returns procurable.

4. None.

5. None.

6. Amount of gold coined during the year 1879, 333,530 milreis. Amount coined from January 1 to June 30, 1880, 173,000 milreis. (Weight of coinage in 1879, 621 kilograms, 8,361 decigrams; in 1880, 305 kilograms, 7,998 decigrams.)

7. Amount of silver coined during the year 1879, 403,990 milreis. Amount coined from January 1, 1880, to June 30, 114,000 milreis. (Weight of coinage in 1879, 10,094 kilograms, 748 grams; in 1880, 2,449 kilograms, 943 grams.)

The second series:

1. The standard coins of gold are the crown, valued 10 milreis; weight in pure gold, 17.735 grams. The half crown, value 5 milreis; weight in pure gold, 8.868 grams. The fifth of a crown, value 2 milreis; weight in pure gold, 3.547 grams. The tenth of a crown, value 1 milreis; weight in pure gold, 1.774 grams.

The standard coins of silver are: The piece of 5 testoons, representing a half milreis; a piece of two testoons, representing a fifth milreis; a piece of 1 testoon, representing a tenth milreis; a piece of 50 rees, or half testoon, representing the twentieth part of a milreis. The quantity of pure silver in the silver coinage was fixed by the law of July 29, 1854, article 5, as "two thirds."

2. Gold is the legal standard of value. The English sovereign, by law of July 29, 1854, was made legal tender, and it is at this present time, with the half sovereign, almost the only gold coin in circulation. Silver is legal tender to the amount of 5 milreis.

3. Gold is the only standard of value.

4. The milreis represents the monetary unit; its weight in pure gold is 1.774 grams.

5. A copy of the law of July 29, 1854,* fixing the coin standard and governing mint operations, was inclosed in my No. 127 of February 21, 1877, with a full translation thereof.*

I forward herewith for the information of the honorable Secretary of the Treasury an official table, issued by the ministry of commerce, of the condition of the banks and

*See Report of Silver Commission, vol. 1, p. 437.

financial institutions for the years 1869 to 1878, both inclusive, being the latest information obtainable on the subject.

In conclusion, I would respectfully refer to my dispatches numbered 127, 298, and 315, which it seems to me exhaust the subject.

Trusting that this information will be acceptable to yourself and the honorable Secretary of the Treasury,

I have the honor to be, sir, your obedient servant,

BENJAMIN MORAN.

Hon. WILLIAM M. EVARTS,
Secretary of State, Washington, D. C.

Table showing amount of gold coined in Lisbon, Portugal.

Period.	In pieces of—				
	10,000 reis.	5,000 reis.	2,000 reis.	1,000 reis.	Total.
From December 12, 1855, to September 30, 1874*.....		3,524,515,000	1,092,900,000	68,057,000	4,685,472,000
From October 1, 1874, to September 30, 1875.....		45,000,000	7,000,000		52,000,000
From October 1, 1875, to September 30, 1876.....		61,000,000	4,000,000		65,000,000
From October 1, 1876, to September 30, 1877.....		76,000,000	6,500,000		82,500,000
From October 1, 1877, to September 30, 1878.....	187,020,000	42,000,000	43,000,000		272,020,000
From October 1, 1878, to September 30, 1879.....	243,010,000				243,010,000
Total.....	430,030,000	3,748,515,000	1,153,400,000	68,057,000	5,400,002,000

* NOTE BY TRANSLATOR.—This amount is the aggregate of table published on p. 452, "Report of the Silver Commission," vol. 1, used for convenience.

Table showing amount of silver coined in Lisbon, Portugal.

Period.	In pieces of—				
	500 reis.	200 reis.	100 reis.	50 reis.	Total.
From July 29, 1854, to September 30, 1874*.....	7,107,605,000	773,030,000	213,270,200	56,522,200	8,100,436,400
From October 1, 1874, to September 30, 1875.....		14,000,000	25,000,000	3,000,000	42,000,000
From October 1, 1875, to September 30, 1876.....	210,000,000	16,000,000	22,000,000		248,000,000
From October 1, 1876, to September 30, 1877.....	25,000,000	6,000,000	10,000,000	8,500,000	49,500,000
From October 1, 1877, to September 30, 1878.....		3,450,000	5,000,000	1,500,000	9,950,000
From October 1, 1878, to September 30, 1879.....	343,990,000	1,560,000	18,000,000	4,000,000	367,550,000
Total.....	7,636,595,000	754,049,000	293,270,200	73,522,200	8,814,436,400

* NOTE BY TRANSLATOR.—This amount is the aggregate of table published on p. 453, "Report of the Silver Commission," vol. 1, used for convenience.

Statement showing imports of gold and silver into Portugal.

Years.	Imports.			
	Bullion.		Coin.	
	Gold.	Silver.	Gold.	Silver.
	<i>Reis.</i>	<i>Reis.</i>	<i>Reis.</i>	<i>Reis.</i>
1869.....	493,000	2,051,000	301,087,500	7,123,000
1870.....	560,000	1,625,000	1,140,892,000	1,138,000
1871.....		2,289,000	3,591,404,000	28,291,000
1872.....		163,000	1,795,255,000	157,000
1873.....	1,200,000	1,671,000	3,907,193,000	21,137,000
1874.....	1,120,000		1,448,234,000	57,766,000
1875.....		5,320,000	2,493,553,000	38,696,000
1876.....	120,000	51,050,000	4,325,105,000	109,852,000
1877.....	2,590,000	16,765,000	718,824,000	42,326,000
1878.....		9,120,000	3,253,380,000	326,595,000

Statement showing exports of gold and silver from Portugal.

Years.	Exports.			
	Bullion.		Coin.	
	Gold.	Silver.	Gold.	Silver.
	<i>Reis.</i>	<i>Reis.</i>	<i>Reis.</i>	<i>Reis.</i>
1869.....		117,235,000	126,256,700	226,498,000
1870.....		34,055,000	68,763,000	192,665,000
1871.....		18,467,000	44,627,000	101,050,000
1872.....		18,115,000	2,620,000	20,673,000
1873.....		8,359,000	32,896,000	28,411,000
1874.....		67,747,000	39,781,000	3,403,000
1875.....		32,625,000	66,455,000	17,937,000
1876.....		1,224,000	1,654,005,000	26,986,000
1877.....	200,000	5,550,000	1,407,838,000	97,893,000
1878.....		5,450,000	1,688,356,000	194,912,000

RUSSIA.

Production of the mines.

GOLD.

Date.	Poods.	Pounds.	Zolot.
1874.....	2,020	31	17
1875.....	1,990	28	15
1876.....	2,053	8	70
1877.....	2,501	30	70
1878.....	2,569	39	63

SILVER.

1874.....	720	14	80
1875.....	601	4	69
1876.....	683	17	.....
1877.....	681	17	85
1878.....	658	2	51

Imports and exports of gold and silver.

GOLD.

Year.	Exported.		Total.	Imported.		Total.
	In bars.	In coin.		In bars.	In coin.	
	<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>
1874.....		17,054,000	17,054,000	355,000	6,198,000	6,553,000
1875.....		27,576,000	27,576,000	215,000	1,506,000	1,721,000
1876.....	8,826,000	93,018,000	101,844,000	175,000	1,313,000	1,488,000
1877.....	176,000	55,735,830	55,911,830	119,000	9,284,000	9,403,000

SILVER.

1874.....	12,000	430,000	442,000	9,435,000	642,000	10,077,000
1875.....		459,000	459,000	4,105,000	615,000	4,720,000
1876.....	82,000	1,328,000	1,410,000	3,242,000	695,000	3,935,000
1877.....	718,000	15,492,800	16,210,800	767,000	780,000	1,547,000

Gold and silver coined in the St. Petersburg mint.

	1874.	1875.	1876.	1877.	1878.	Total.
	<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>
Gold.....	24,810,027	20,300,024	30,189,040	33,150,024	34,582,048	143,031,163
Silver, 83 $\frac{1}{2}$ proof...	700,005.25	700,005.25	800,008.75	7,884,005.25	8,918,010.50	19,002,035
Silver, 48 proof...	4,276,001.50	4,400,001.50	5,217,002.50	2,263,001.50	7,443,253	23,599,260

Deposits of gold and silver coin and bars on hand January 1 in the treasury of the empire, the mint, the government bank, and branches of these institutions.

GOLD.

Belonging to imperial treasury, the different branches, and in St. Petersburg mint.		In Imperial Bank.		In St. Petersburg mint, belonging to different departments and different people.		Total.		Total.
In coin.	In bars.	In coin.	In bars.	In coin.	In bars.	In coin.	In bars.	
<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>	<i>Rubles.</i>
1875 1,946,542	3,555,085	146,069,100	57,814,739	4,223,800	10,399,452	152,239,532	71,769,276	224,008,808
1876 2,043,479	4,458,196	150,166,142	57,482,667	783,300	14,672,930	152,992,921	76,614,793	229,607,714
1877 2,735,008	4,720,031	75,668,448	48,775,958	6,453,745	7,045,574	84,857,201	60,541,563	145,398,764
1878 6,455,466	167,733	90,168,284	41,830,079	6,406,215	8,020,010	103,029,965	50,017,822	153,047,787

SILVER.

1875 917,695	1,996,047	11,606,137	19,156,262	.....	655,518	12,523,832	21,807,827	34,331,659
1876 824,122	2,104,549	11,563,404	17,858,305	.....	645,318	12,387,526	20,608,172	32,995,698
1877 102,003	1,504,478	9,885,086	16,891,172	.....	532,849	9,987,098	18,928,499	28,915,588
1878 1,130,528	.....	6,050,638	11,709,557	6,011	83,839	7,187,177	11,793,396	18,980,573

NOTE 1.—In the above tables only banco silver of 83 $\frac{1}{2}$ proof is taken into account.

NOTE 2.—Besides the silver shown in the above tables there is other silver on hand of 48 proof, as follows:

	<i>Rubles.</i>
1874.....	1,186,624
1875.....	2,299,325
1876.....	3,434,283
1877.....	4,823,006
1878.....	4,421,646

To question 4. Gold has been the principal metal mined since 1825. Systematic mining of gold commenced in 1751. Since then the production has been 80,000 puds. During the ten years from 1868 to 1877 amounts have been—

Years.	Puds.	Years.	Puds.
1868.....	1,710	1873.....	2,020
1869.....	2,010	1874.....	2,030
1870.....	2,160	1875.....	2,000
1871.....	2,400	1876.....	2,050
1872.....	2,330	1877.....	2,520

To question 5. Production of silver during the ten years from 1868 to 1877 as follows:

Years.	Puds.	Years.	Puds.
1868.....	1,120	1873.....	610
1869.....	1,770	1874.....	720
1870.....	870	1875.....	600
1871.....	830	1876.....	680
1872.....	750	1877.....	680

To question 6. Imports and exports of gold and silver (not shown separately) as follows:

Years.	Imports.	Exports.
	<i>Roubles.</i>	<i>Roubles.</i>
1869.....	2,600,000	15,700,000
1870.....	2,700,000	23,900,000
1871.....	7,400,000	17,700,000
1872.....	13,000,000	7,900,000
1873.....	20,600,000	14,700,000
1874.....	16,600,000	17,500,000
1875.....	6,400,000	28,000,000
1876.....	5,400,000	103,300,000
1877.....	10,900,000	19,300,000
1878.....	16,500,000	14,200,000

The quantity of the precious metals consumed in the arts and manufactures cannot be ascertained.

Coinage of gold since 1800.

Period.	Roubles.	Period.	Roubles.
1800-1809.....	4,300,000	1840-1849.....	137,300,000
1810-1819.....	29,700,000	1850-1859.....	200,500,000
1820-1829.....	31,800,000	1860-1869.....	221,000,000
1830-1839.....	65,400,000	1870-1878.....	201,700,000

Coinage of gold from 1869 to 1878.

Years.	Half imperials.		Three roubles.		Total.
	<i>Pieces.</i>	<i>Value.</i>	<i>Pieces.</i>	<i>Value.</i>	<i>Roubles.</i>
1869.....	3,900,000	19,500,000	140,000	420,000	19,920,000
1870.....	5,000,000	25,000,000	200,000	600,000	25,600,000
1871.....	800,000	4,000,000	200,000	600,000	4,600,000
1872.....	2,400,000	12,000,000	100,000	300,000	12,300,000
1873.....	3,000,000	15,000,000	80,000	240,000	15,240,000
1874.....	4,800,000	24,000,000	270,000	810,000	24,810,000
1875.....	4,000,000	20,000,000	100,000	300,000	20,300,000
1876.....	6,000,000	30,000,000	60,000	180,000	30,180,000
1877.....	6,600,000	33,000,000	50,000	150,000	33,150,000
1878.....	6,800,000	34,000,000	190,000	570,000	34,570,000

Silver coinage from 1869 to 1878.

[83½ zolotinks fine.]

Years.	Roubles.	Half roubles.	Quarter roubles.	Total.
	<i>Roubles.</i>	<i>Roubles.</i>	<i>Roubles.</i>	<i>Roubles.</i>
1869.....	300,000	10,000	5,000	315,000
1870.....	400,000	5,000	10,000	415,000
1871.....	900,000	10,000	5,000	915,000
1872.....	1,000,000	10,000	10,000	1,020,000
1873.....	700,000	20,000	10,000	730,000
1874.....	700,000	10,000	10,000	720,000
1875.....	700,000	5,000	5,000	710,000
1876.....	800,000	10,000	10,000	820,000
1877.....	6,900,000	520,000	450,000	7,870,000
1878.....	8,100,000	390,000	440,000	8,930,000
Total.....	20,500,000	990,000	955,000	22,445,000

Silver coinage from 1869 to 1878.

[48 zolotinks fine.]

Years.	Twenty copecks.	Fifteen copecks.	Ten copecks.	Five copecks.	Total roubles.
1869.....	3,400,000	1,220,000	370,000	10,000	5,000,000
1870.....	3,250,000	1,410,000	330,000	10,000	5,000,000
1871.....	3,370,000	1,420,000	420,000	10,000	5,220,000
1872.....	2,400,000	880,000	210,000	10,000	3,500,000
1873.....	3,040,000	1,190,000	260,000	10,000	4,500,000
1874.....	2,970,000	1,040,000	250,000	10,000	4,270,000
1875.....	2,910,000	1,120,000	360,000	10,000	4,400,000
1876.....	3,250,000	1,460,000	490,000	10,000	5,210,000
1877.....	1,390,000	650,000	210,000	10,000	2,260,000
1878.....	5,070,000	1,670,000	690,000	10,000	7,440,000
Total.....	31,050,000	12,060,000	3,590,000	100,000	46,800,000
Total silver coinage (roubles).....					69,245,000

TURKEY.

Monetary system of the Ottoman Empire.

Money is coined by the state. The imperial mint at Constantinople buys gold and silver bullion at the standard rate of 48 piasters per drachm of pure gold $\frac{1}{1000}$ fine, and 3 piasters $12\frac{1}{2}$ centimes per drachm of pure silver $\frac{1}{1000}$ fine. But for bullion below the standard only $47\frac{1}{2}$ piasters per drachm of pure gold are paid, and only 3 piasters $2\frac{1}{2}$ centimes per drachm for silver.

A drachm or 16 carats equals .003 grams, .2073625.

An oki or 400 drachms equals 1 kilogram, 282 grams, .945.

An oki or 400 drachms, 1 kilogram, 282 grams; 945 milligrams of pure gold cost 192 pieces of gold in Turkish pounds of 100 piasters each, or 4,368 francs (a Turkish pound calculated at the legal rate of 22 francs 75 centimes).

An oki of pure silver costs $62\frac{1}{2}$ pieces of silver in medijies of 20 piasters each, or 281 francs 25 centimes (the legal value of each mediji being 4 francs 50 centimes).

The following are the denominations of gold and silver pieces, their dimensions, weights, and standard of fineness:

GOLD.

One piece of 500 piasters weighs 11 drachms, 4 carats, or 36 grams, 82 milligrams, and has a dimension of 35 millimeters.

One piece of 250 piasters weighs 5 drachms, 10 carats, or 18 grams, 41 milligrams, and has a dimension of $37\frac{1}{2}$ millimeters.

One piece of 100 piasters, 2 drachms, 4 carats, or 7 grams, 216 milligrams, and has a dimension of $22\frac{1}{2}$ millimeters.

One piece of 50 piasters, 1 drachm, 2 carats, or 3 grams, 608 milligrams, and has a dimension of 18 millimeters.

One piece of 25 piasters, 0 drachms, 9 carats, or 1 gram, 804 milligrams, and has a dimension of $14\frac{1}{2}$ millimeters.

Fineness of above, .916½.

SILVER.

One piece of 20 piasters weighs 7 drachms, 8 carats, or 24 grams, 55 milligrams; dimension 37 millimeters.

One piece of 10 piasters weighs 3 drachms, 12 carats, or 12 grams, 27 milligrams; dimension 27½ millimeters.

One piece of 5 piasters weighs 1 drachm, 14 carats, or 6 grams, 13 milligrams; dimension 24 millimeters.

One piece of 2 piasters weighs 0 drachms, 12 carats, or 2 grams, 405 milligrams; dimension 18½ millimeters.

One piece of 1 piaster weighs 0 drachms, 6 carats, or 1 gram, 202 milligrams; dimension 15 millimeters.

One piece of ½ piaster weighs 0 drachms, 3 carats, or 0 grams, 601 milligrams; diameter 13½ millimeters.

Fineness of the above, .830.

The tolerance in the coinage of gold for weight and fineness is 2 per 1000, more or less. For silver, 3 per 1000, more or less.

The imperial mint charges are 1 per cent. for gold and 2.734 per cent. for silver for the cost of coinage, for loss, and for the value of the alloy.

The rate of gold to silver is 1 to 15.0909.

Relative value of Ottoman moneys.

Date.	Gold.	Silver.	Copper.	Paper.	Beshlik or metallik.
December 18, 1876.....	100	104.5	150	124	-----
November 25, 1878.....	100	107.0	180	350	-----
December 2, 1879.....	100	106.5	370	860	117.375

For the past eight months or more the paper money has been refused by traders. It depreciated until by general consent the circulation was abandoned.

Various devices for retiring it have been adopted. Among them, to receive one-fifth of certain taxes in paper at 25 per cent. of the nominal value is one. The Imperial Ottoman Bank superintended the issue, numbering and registering the notes, and the bank is now charged with the withdrawal. The latest report is to the close of the last month, and is a brief summary of this short-lived currency.

At first copper money took the place of the paper in the markets and the smaller retail trade. But for some unexplained reason it soon began to depreciate until it sunk to the level of the paper, and like it was discarded. This was not the result of increased coinage, for no copper had been coined in the last ten years. The only use made of it at present is in payment of tolls across the bridges between Galata and Stamboul; and as the bridges are constantly thronged this use is considerable.

Now the principal business is transacted with silver and an absolute coinage called beshlik or metallik. The latter, of which none has been struck since about the fifth year of Sultan Medjid (1844), is silver, with so much alloy as to disfigure it and to render the coins disproportionately large. A few specimens are inclosed. In considerable sums it is exchangeable for silver at fully 10 per cent. discount. The smallest silver coin is a piece of 20 paras, a half-piaster, equal in value to one English penny. There are also coins of 1, of 2, of 5, of 10, and 20 piasters, called the Medjidich, in honor of the Sultan Medjid, in the early part of whose reign it and the rest of the series were first coined. The 5-piaster coin is called by the Turks sometimes the tcherek or quarter piece, sometimes the beshlik or piece of five; the others have no particular name, I believe.

The history of Turkish money would be instructive as illustrating the tendency generally prevalent to lower the value of the money unit. For years in Turkey the piaster has been the money unit; that is, the money of account has been reckoned in piasters. The piaster is divided into 40 paras, and the latter was formerly subdivided into 3 aspers. In the fifteenth century the asper was a silver coin of considerable value. (See Gibbon, Chapter LXV, where mention is made of an annual pension of 300,000 aspers, and the notes on the passage, Milman's edition.) Persons not very old remember to have heard their fathers describe the asper as a piece of money which in their early days was current in small traffic.

The para was coined in silver at a comparatively recent period, and I have in my possession specimens of it. But this, like the asper, was debased until its value was too small to be reckoned in trade. The smallest piece now current is one of 5 paras, equal to a half cent of our money, and, like the half cent of our early coinage, of little use. In 1801, the reign of Sultan Selim III, the piaster contained 95.7 grains of

pure silver, value \$0.258, but during the reign of Sultan Mahmoud II, from 1808 to 1839, the coin was rapidly debased. In 1818 the piaster contained but 67.7 grains of pure silver, value \$0.18½. At length silver was supplanted by the adulterated beshlik or metallik just mentioned. Finally, when the coinage of silver was restored by his son and successor, Sultan Medjid, the piaster had fallen to \$0.043 in value.

The restoration of the currency to a metallic basis has not counteracted the disorder in the public finances. On the other hand, the burden of the government seems to rest heavily on the general community. Although trade is stagnant, prices have been increased enormously. Rents, food, fuel, and service of all kinds have risen in many instances 40 per cent. higher than they were three years ago, and the cost of living is greatly enhanced. In a word, those who do not pay contrive to be supported at the expense of those who do. Many persons believe the end draws nigh; I think, not yet.

I am, sir, very respectfully, your obedient servant,

HORACE MAYNARD.

MEXICO.

Deposits of gold and silver at the mints of Mexico during the fiscal year ended June 30, 1878.

Locality of production.	Gold.		Silver.	
	Weight.	Value.	Weight.	Value.
	Kilograms.		Kilograms.	
Chihuahua	4.215	\$2,713 31	27,060.793	\$1,058,320 18
Durango	25.402	16,346 62	22,421.001	876,862 80
Guanajuato	448.158	288,401 48	110,509.028	4,321,897 57
Guerrero .....	.276	177 93	2,194.106	85,809 29
Hidalgo	74.985	48,255 51	85,398.428	3,339,847 11
Jalisco			35,619.728	1,393,051 89
Mexico			4,982.894	194,875 83
Michoacan	214.428	137,991 21	11,385.732	445,284 58
Oaxaca	4.201	2,703 45	3,243.375	126,845 13
Puebla	1.717	1,105 26	333.676	13,049 73
Queretaro			121.186	4,739 46
San Luis Potosi	56.287	36,222 76	53,514.190	2,092,886 41
Sinaloa	56.523	36,374 18	20,380.584	797,064 25
Sonora	54.355	34,979 01	49,090.117	1,919,865 37
Zacatecas	79.155	50,926 6½	120,522.294	4,713,596 32
Plate, &c	8.061	5,188 46	1,735.625	67,878 55
Total	1,027.761	661,385 79	548,512.757	21,451,784 47

Deposits of gold and silver at the mints of Mexico during the fiscal year ended June 30, 1879.

Locality of production.	Gold.		Silver.	
	Weight.	Value.	Weight.	Value.
	Kilograms.		Kilograms.	
Chihuahua	72.169	\$46,442 83	27,925.958	\$1,092,157 43
Durango	31.936	20,551 52	28,534.697	1,115,965 10
Guanajuato	422.047	271,599 48	105,311.621	4,118,632 27
Guerrero .....	.717	461 95	2,005.612	78,437 99
Hidalgo	78.845	50,739 03	95,501.983	3,734,986 90
Jalisco	5.644	3,632 65	34,222.216	1,338,392 70
Mexico	29.610	19,054 87	8,909.615	348,446 11
Michoacan	71.847	46,235 71	6,076.003	237,626 01
Oaxaca	7.029	4,522 94	3,810.244	149,014 81
Puebla	10.104	6,502 21	712.991	27,884 27
Queretaro .....	.003	2 21	230.872	9,029 15
San Luis Potosi	109.844	70,687 79	67,838.861	2,653,109 62
Sinaloa	19.046	12,256 42	11,705.015	457,771 44
Sonora	38.641	24,866 82	32,917.049	1,287,352 89
Zacatecas	63.649	40,958 15	117,417.861	4,592,097 90
Plate, &c	40.850	26,288 15	2,128.973	83,261 96
Parted	27.181	17,491 76	2,008.572	78,553 24
Unknown sources .....	.357	229 93	66.762	2,610 99
Total	1,029.519	662,524 42	547,324.905	21,405,830 78

Coinage of the mints of Mexico by fiscal years.

GOLD.

Mint.	1875.	1876.	1877.	1878.	1879.	Total.
Zacatecas.....	\$42,990 00	\$50,731 50	\$30,765 00	\$23,720 00	\$50,111 00	\$198,317 50
Guanajuato.....	386,000 00	323,900 00	307,500 00	299,000 00	207,640 00	1,524,240 00
Mexico.....	224,000 00	284,000 00	268,000 00	290,000 00	304,500 00	1,370,500 00
San Luis Potosi.....						
Guadalajara.....	7,100 00					10,830 00
Alamos.....	16,440 00	6,420 00	5,520 00	5,235 00	13,700 00	47,315 00
Chihuahua.....	13,600 00	21,920 00	1,900 00	1,100 00		38,520 00
Culiacan.....	50,529 00	55,920 00	52,790 00	40,923 00	49,230 00	249,392 00
Durango.....	26,180 00	19,480 00	17,725 00	17,410 00	23,935 00	104,730 00
Hermosillo.....	87,640 00	40,270 00	6,830 00	11,730 00	1,860 00	147,830 00
Oaxaca.....	8,140 00	6,760 00	4,720 00	2,880 00	3,700 00	26,200 00
Total.....	862,619 00	809,401 50	695,750 00	691,998 00	658,206 00	3,717,974 50

SILVER.

Zacatecas.....	\$5,013,000 00	\$5,027,614 00	\$4,791,600 00	\$4,942,000 00	\$4,775,000 00	\$24,549,214 00
Guanajuato.....	4,297,000 00	4,301,976 00	4,464,000 00	4,525,000 00	4,321,000 00	21,908,976 00
Mexico.....	2,761,000 00	3,335,000 00	4,611,000 00	4,488,700 00	5,116,000 00	20,811,700 00
San Luis Potosi.....	2,275,855 00	1,936,500 00	2,091,964 00	2,010,126 00	2,519,110 00	10,833,565 00
Guadalajara.....	1,154,535 00	1,143,380 00	1,321,585 00	1,462,960 00	1,413,161 00	6,495,621 00
Alamos.....	948,804 75	771,480 50	920,114 00	1,050,583 75	756,598 15	4,447,581 15
Chihuahua.....	893,431 00	977,812 00	658,264 00	910,506 00	806,025 00	4,246,038 00
Culiacan.....	726,339 75	746,396 50	771,412 00	845,439 00	891,951 00	3,981,538 25
Durango.....	718,233 00	673,570 00	868,195 00	850,106 75	854,882 50	3,964,987 25
Hermosillo.....	469,929 60	410,641 00	783,065 50	866,268 00	555,650 00	3,085,553 50
Oaxaca.....	128,821 00	129,684 00	133,929 00	132,514 00	153,610 00	678,558 00
Total.....	19,386,958 50	19,454,054 00	21,415,128 50	22,084,263 50	22,162,987 65	104,503,332 15

Coinage of the mints of Mexico by fiscal years (pieces and value).

GOLD.

Years.	Twenty dol- lars.	Ten dollars.	Five dollars.	Two and a half dollars.	Dollars.	Total value.
	<i>Pieces.</i>	<i>Pieces.</i>	<i>Pieces.</i>	<i>Pieces.</i>	<i>Pieces.</i>	
1875.....	37,940	8,363	3,223	400	3,074	\$862,619 00
1876.....	37,316	5,065	1,736	821	1,699	809,401 50
1877.....	32,716	2,277	3,332	400	1,000	695,750 00
1878.....	31,768	3,656	2,816	1,100	3,248	691,998 00
1879.....	28,252	8,099	1,984	400	1,256	658,206 00

SILVER.

Years.	Dollar.	50 centavos.	25 centavos.	10 centavos.	5 centavos.	Total value.
	<i>Pieces.</i>	<i>Pieces.</i>	<i>Pieces.</i>	<i>Pieces.</i>	<i>Pieces.</i>	
1875.....	18,946,214	354,584	820,305	377,863	411,799	\$19,386,958 50
1876.....	18,814,652	687,271	951,782	308,140	540,140	19,454,054 00
1877.....	20,886,007	473,620	970,002	382,740	230,740	21,415,128 50
1878.....	21,420,974	606,350	1,253,183	215,160	504,855	22,084,263 50
1879.....	21,488,699	585,855	1,129,142	620,508	740,497	22,162,987 65

Total coinage of the mints of Mexico from their establishment to June 30, 1879.

COLONIAL.

Date.	Gold.	Silver.	Copper.	Total.
Macuquina (cob), 1537-1731.....	\$8,497,950	\$752,067,456 54	\$200,000 00	\$760,765,406 54
Columnaria (pillar), 1732-1771.....	19,889,014	441,629,211 45		461,518,225 45
Busto (head), 1772-1821.....	40,391,447	888,583,989 45	342,893 37	929,298,329 82
Total.....	68,778,411	2,082,260,657 44	542,893 37	2,151,581,961 81

Total coinage of the mints of Mexico, &c.—Continued.

INDEPENDENT.

Date.	Gold.	Silver.	Copper.	Total.
Bust of Iturbide, 1822-23.....	\$557,392 00	\$18,575,569 69	.....	\$19,132,961 69
Republic (eagle), 1824 to June 30, 1874.....	45,907,372 11	759,092,552 58	\$5,251,143 60	810,251,068 29
July 1, 1874, to June 30, 1879.....	3,717,974 50	104,503,332 15	119,066 04	108,340,372 69
Total.....	50,182,738, 61	882,171,454 42	5,370,209 64	937,724,402 67

RECAPITULATION.

Colonial.....	\$2,151,581,961 81
Independent.....	937,724,402 67
Total.....	3,089,306,364 48

MEXICAN REPUBLIC, MINISTRY OF FOMENTO, COLONIZATION, INDUSTRY, AND COMMERCE. MEXICO, SECTION 2, 259.

The information that can be given by this department in compliance with the request made by the department under your charge by the minister of the United States of America, in the communication which was transmitted to me on the 20th of May last, is as follows, the whole referring to the year 1879:

Value of the gold yielded by the mines of the republic, approximately...	\$989,161
Value of the silver produced by the mines, approximately.....	25,167,763
Value of the gold coined at the various mints of the republic (see also document No. 1).....	589,161
Value of the silver coined at the same mints (see document No. 1).....	23,667,763

As to the second series of questions propounded by the minister of the United States I have to state, that replies to the first, fourth, and fifth will be found in the regulations that have been published in the republic with regard to value, weight, and alloy, and likewise in the circular relative to the mode of procedure to be observed in examining orders presented by mints (documents 2, 3, 4, and 5). The second and third questions are answered as follows:

2d. The standard value of pure gold is \$675.41 per kilogram. The standard value of pure silver is \$40.91 per kilogram. These values have been deduced from the quantity of pure metal which, according to law, must be contained in a piece of gold of the value of \$20 and the weight of silver.

3d. The standard of the value of money is the monetary unit, which is the silver dollar. The proportion existing between this metal and gold already coined is as one to sixteen, which proportion is obtained by comparing the value which a kilogram of gold coins must have according to the law regulating the currency.

The value given of the gold and silver yielded must be considered as an approximation only, it being impossible to ascertain how much is exported clandestinely, nor do any data exist with regard to the quantity used in arts and manufactures.

Liberty and constitution.

Mexico, August 18, 1880.

M. FERNANDEZ,
Chief Clerk.

The SECRETARY OF FOREIGN RELATIONS.

Table showing the amount of gold and silver coined by the mints of the Republic during the year 1879.

Mints.	Silver.	Gold.
Alamos	\$770, 776 50	\$10, 780 00
Chihuahua	827, 339 00	
Culiacan	886, 048 00	50, 236 00
Durango	990, 919 50	24, 665 00
Guadalajara	1, 480, 619 00	2, 000 00
Guanajuato	4, 505, 000 00	164, 040 00
Hermosillo	576, 135 00	
Mexico	5, 616, 300 00	290, 500 00
Oaxaca	153, 000 00	2, 100 00
San Luis Potosi	2, 666, 555 00	
Zacatecas	5, 285, 000 60	
Total	23, 667, 763 00	589, 161 00
Silver	23, 667, 763 00	
Gold	589, 161 00	
Total	24, 256, 924 00	

A. BARROTO.

CENTRAL AMERICA.

OFFICE OF THE SECRETARY OF FINANCE AND COMMERCE
OF THE REPUBLIC OF COSTA RICA,
National Palace, San José, May 11, 1880.

Hon. SECRETARY OF STATE,

In the Department of Foreign Relations:

I take pleasure in answering as far as possible the questions your excellency was pleased to ask me in your esteemed dispatch of the 12th of August, 1879, in behalf of Mr. C. A. Logan, minister resident of the United States of America in Guatemala.

In the data which I propose to submit, I shall observe the order in which the questions are found.

I. The quantity of gold coined in national money, and which exists in circulation, is \$2,318,381.76.

II. That of silver money of the same origin amounts to \$373,919.88.

The kinds of coins in circulation are classified thus:

GOLD COINS.

0.875 fine.

Grains. (gramost)

Half ounces, with the weight of	254
Quarter ounces, with the weight of	127
Eighth ounces, with the weight of	63
One-sixteenth ounces, with the weight of	31
Ten dollars, with the weight of	294
Five dollars, with the weight of	147
Two dollars, with the weight of	59
One dollar, with the weight of	29

SILVER COINS.

0.750 fine.

50 cents (centavos), weight of	254
25 cents (centavos), weight of	127
10 cents (centavos), weight of	50
5 cents (centavos), weight of	25

In addition, a very considerable amount of foreign coins are in circulation, whose value is fixed by law in the following manner:

Pieces of \$20, North American	\$22 50
Pieces of £ sterling	5 45
Pieces of 20 francs	4 35

Pieces of 20 soles, Peru	\$21 70
Pieces of \$10, Colombia	10 85
Pieces of \$10, Guatemala	10 85
Strong ounces, legitimate weight	17 65

III. Paper money emitted, \$106,699.30. In circulation, \$103,347.80, at present date, April 12, 1880.

IV. *Mines*.—Notwithstanding the rich minerals which abound in the republic, the lack of capital, of labor, and of intelligent and practical men prevents their being worked on the grand scale on which it should be done.

V. There is no silver mine in operation; but this metal is imported, and in the mint is actually being coined \$200,000 of this kind of metal.

VI. The coinage of gold and silver is detailed in the adjoining tables, extending from 1829 to 1877.

VII. It is not possible to obtain data, even approximate, concerning the importation of silver, stamped or in bars; and as regards exportation, as no silver is being mined, there is no exportation of that metal.

The use made of gold and silver in the arts is relatively insignificant, since the greater part of the jewelry is brought from abroad.

It is impossible for me to determine the quantity of gold, coined and in bullion, existing in the banks, because these establishments, though they submit data which express the movement which they have during the year, which is published in the memorial of finance, do not do the same with respect to their existence in metal.

I regret that I am unable to submit to your excellency fuller and more detailed information; but that herein comprised will, I think, satisfy the minister of the United States of America.

Begging that your excellency will be pleased to excuse the tardiness of this answer, considering the object which caused it, I have the honor to repeat that I am your excellency's very attentive and very obedient servant,

SALVE LARA.

SOUTH AMERICA.

PERU.

OFFICIAL DECREES—NATIONAL MONEY.

The following is the decree referred to in our last, and which we stated would appear to-day:

[Translation.]

Nicholas de Pierola, supreme head of the republic, considering:

1st. That the pound sterling having been provisionally adopted as legal money, it is now necessary to frame the law in conformity with which the national money must be manufactured.

2d. That by the resolution of the 14th of January last, gold has been declared as the legal circulating medium: I decree—

ARTICLE 1. The standard circulation of Peru shall be a gold coin weighing 1.16200 grams of the standard of 900 millesimals exact, and to be denominated "Inca."

ART. 2. Gold coins of 1, 2, and 3 incas shall be manufactured, of the corresponding weight and standard in accordance with preceding article. The allowance in the alloy over or under shall be of 2 millesimals. The allowance in the weight shall be, in the piece of 5 incas, of $2\frac{1}{2}$ milligrams over or under, in that of 2 incas, $2\frac{3}{4}$ of a milligram, and in that of 1 inca, 4 milligrams. The diameter of the piece of 1 inca shall be 12 millimeters, that of 2 incas 15, and that of 5 incas 23 millimeters.

ART. 3. The inca shall be divided into 5 pesetas, each peseta into 2 reals, each real into two half reals, and each half real into 5 cents.

ART. 4. Copper coins shall be manufactured of the value of 1 and 2 cents, and silver coins of half a real, one real, of 1 peseta, and of 5 pesetas.

ART. 5. The coins of 1 and 2 cents shall be of copper; the price of the metals of aligation, joined to the cost of manufacture, corresponding to the intrinsic value of the twentieth part of a peseta. The copper coin shall bear in the center of the obverse side a sun underneath the inscription *Republica Peruano*, and on the upper part of the date; on the reverse side, the words 2 or 1 cent, surrounded by a garland formed of cornucopias.

ART. 6. The pieces of 5 pesetas, 1 peseta, 1 real, and a half real shall weigh, the first 25 grams; the second, 5 grams; the third, 2 grams and 500 milligrams, and the fourth, 1 gram and 250 milligrams. The allowance in the weight for each gram over 100 shall be of 3 milligrams in the coins of 5 pesetas, of 6 milligrams in those of 1

peseta, of 7 milligrams in those of 1 real, and of 10 milligrams in those of half a real. The alloy of these silver coins shall be that of nine-tenths exact, with the allowance of 3 millesimals over or under. The diameter of the 5 peseta pieces shall be 37 millimeters, in those of a peseta 23, in those of a real 18, and in those of a half real 15.

ART. 7. The pattern of the gold pieces shall be the following: In the center of the obverse the bust of the republic; on the exergue the inscription *Prosperidad y poder por la justicia* (prosperity and power through justice), and on the under part of the date; on the reverse side the arms of the republic with two standards and a laurel; on the exergue the inscription *Republica Peruano*, Lima, 900 millesimals exact; the initials of the names of the assayers and the value. The pattern of the silver pieces shall be the same as that of the gold pieces, with the difference that the shield will bear a palm and a laurel in place of the standard.

ART. 8. No one is compelled to receive silver beyond the amount of 25 pesetas, nor copper beyond 20 cents.

ART. 9. The preceding laws referring to money are hereby abolished.

The secretary of state in the department of hacienda and commerce is charged with the fulfillment of this decree, as also its publication and circulation.

Given in the government house in Lima this 23d day of March, 1880.

NICHOLAS DE PIEROLA.

MANUEL A. BARINAGA.

LIMA, March 23, 1880.

It being urgently necessary to proceed to the coinage of money, in accordance with the supreme decree of this date, to further the speedy re-establishment of metallic currency, it is ordered:

1st. The mint shall proceed immediately to purchase all the silver bullion existing at present in that establishment, or that may henceforward be taken there, at the price ruling in the market, fixed on the basis of exchange at 12 pence per sol.

2d. The said mint shall proceed to convert said bullion into silver coins, for the time being, of one peseta of real, and half a real, in the proportions that may be decided by the secretary of the hacienda.

3d. The said secretary will give the necessary instructions for the better carrying out of present orders.

Register and publish.

BARINAGA.

ARGENTINE REPUBLIC.

Fourth and fifth questions. What is the amount of gold produced annually from the mines? What is the amount of silver produced annually?

The production of our mines is actually very limited. The gold produced is due, for the most part, to the copper mines more than to the gold mines. The gold in this form does not benefit the country, except that it [*sic*] exported to England in alloy with copper in bars, to be worked.

The bars of copper contain a quantity of silver. The mines that are being worked in the Republic are those of Famatinas, in the province of Rioja, and in Carolinas, province of San Luis, at which places gold is also obtained by washing on a small scale, without much capital being invested.

The production of silver proceeds almost entirely from the Famatinas mines, which produce it in a native state and in minerals, also being found in sulphuret of lead, as occurs in the provinces of Cordoba, San Luis, San Juan, and Mendoza.

It is not possible as yet to value with exactitude the production of the silver and gold, as there is not yet any organized enterprise for the working of the mines, with the exception of that of Lafore, in Capilitas, province of Catamarca. However, their product can be calculated for the year.

Gold:	Ounces.
Mines of San Luis and Famatinas	500
By washing San Luis and Famatinas.....	800
Proceeding from copper	2,500
	<hr/> 3,800

Silver:	Ounces.
Famatinas mines	160,000
Uspallata	25,000
Obtained from lead ore, from Cordoba, San Juan, and Mendoza	30,000
Contained in copper ore from Famatinas.....	110,000
	<hr/> 325,000

Sixth and seventh questions. What is the amount of silver annually coined, imported, exported, and consumed in the arts and manufactures?

As regards the coining of money, the honorable Congress of the nation has sanctioned the law, a copy of which I inclose.

Exportation is chiefly carried on with England, a part also being sent to Chili, for sale there. Lamport and Holt's company has carried to England during the current year gold and silver to the value of £415,589 11s. 6d.

The consumption of silver and of gold is on such a small scale that it is very difficult to calculate the quantity, as it consists chiefly in what is used for ornamenting articles of use, such as spurs, bridles, harness and trappings, mate-cups and bourbilas (tubes), and some objects for sacred use.

Thus satisfying as far as possible the request of your excellency, I beg of your excellency to accept the assurance of my greatest consideration.

F. GONZALES.

VENEZUELA.

LEGATION OF THE UNITED STATES,
Caracas, September 22, 1880.

SIR: Referring to your separate communication to me of April 30, 1880, and to my No. 269 and its inclosure, all relative to desired monetary information, &c., I inclose herewith:

1st. A copy and translation of a note from Mr. Saavedra, embodying such statistical data in the premises as were transmitted to him by the minister de fomento.

2d. A copy of my note in response to that of Mr. Saavedra.

3d. The half sheet of the extraordinary number of the *Gaceta Oficial*, of April 3, 1879, sent me with Mr. Saavedra's note, and containing a copy of the existing law of money. As I presume this document will be passed to the Secretary of the Treasury, I do not number it; neither under the circumstances do I reckon it requisite to translate it, as indeed I have not time to do so before the departure of the next mail for the United States, which leaves Caracas to-morrow morning.

I also add the following observations relative to the money matter of Venezuela:

1st. The Venezuela monetary law being the same as that of France, with the sole nominal difference that the French monetary unit, the franc, is adopted as the monetary unit of Venezuela under the name of *bolivar*, it will be easy for the Secretary of the Treasury to appreciate Venezuelan money under several important relations by recurring to the familiar standard of France.

2d. The statement in Mr. Saavedra's note, delivered from the minister de fomento, that "there is no paper money," needs explanation, in order to avoid misunderstanding. I suppose that what is meant is that there is no paper money issued by the government, or which is by law made legal tender; and I understand that there is, in fact, none such. But there is a bank, the Bank of Caracas, the paper issue of which is, I am told by its president, 1,300,000 bolivars, or 260,000 venezuelanos.

3d. There being no mint in the country, its coinage has been done abroad; and its coins are as follows:

First. Of gold there are two coins, having the respective values of 25 and 20 bolivars.

Second. Of silver there are seven coins; first, the *bolivar*, the monetary unit, equaling the franc; second, the venezuelano, equaling 5 bolivars; third, a coin equaling $2\frac{1}{2}$ bolivars; fourth, one equaling 2 bolivars; fifth, one equaling one-half bolivar; sixth, one equaling one-fourth bolivar; seventh, one equaling one-fifth bolivar.

Third. Of nickel there are two coins, having the respective values of one-twentieth and one-eighth of a bolivar.

Fourth. Of copper there is one coin, equaling one-twentieth of a bolivar.

4th. I am informed that the paper notes of the Bank of Caracas were made and printed in the United States; that the preceding coinage of gold and silver was done in France and Belgium; that of nickel in the United States; and that of copper in England.

5th. The monetary circulation of the country consists of the preceding domestic paper and coins, together with a much larger amount of foreign coins.

6th. I have endeavored to form some proximate idea as to what may be the total amount of the circulating medium of the country; and to this end I have consulted three persons, whose judgment I prefer upon such a point. One gives no numerical indication; another judges the amount to be about ten to twelve million dollars; and the third, after considering and consulting about the matter, concurs in the last judgment. The average of these approximations would be eleven million dollars.

According to the census which was taken in 1873, and published in 1874, the total population of the country was 1,784,194, and it is believed to have increased but little since.

Supposing the present population to be from 1,800,000 to 1,900,000, and adopting \$11,000,000 as the approximate total circulating medium, we have the result of about \$5.79 to \$6.11 *per capita*, which, I presume, will be found to be much less than the corresponding proportion for the United States and several countries of Europe.

As being germane to the subject, I suggest that my No. 251, and its annex, be taken in connection with this.

I am, sir, your obedient servant,

JOHN BAKER.

Hon. WM. M. EVARTS,
Secretary of State.

[Translation.]

CARACAS, September 13, 1880.

MR. MINISTER: With reference to my official letter of the 26th ultimo, relative to the statistical data solicited by your excellency, I have the honor of communicating to your excellency those which the minister de fomento has transmitted to me.

There is no deposit of gold and silver in the offices of finance of the nation, because the estimate is always limited to the strictly indispensable expenses of the republic.

There is no paper money.

There are no mines of silver in operation; with regard to gold, those of Guayana, the only ones which pay, in the year from 1875 to 1876—which are the last data that are had—there were exported 1,993 kilograms of gold in bars of 24 carats (*quilates*).

There is no coinage of money in the country.

The exportation of coined silver and gold in 1874 to 1875 amounted to 1,144,862.86 venezuelanos, and in 1875 to 1876 to 407,505.68 venezuelanos.

The Venezuelan law of money is exactly the same as that which rules in France, with the sole difference that the franc is called *bolivar*—monetary unit of the same type, weight, and alloy (*bi*) as that.

To facilitate your excellency in understanding this last point, I have the pleasure of inclosing to your excellency the *Gaceta Oficial*, number extraordinary, of the 3d of April, 1879, where the existing laws of money will be found.

Hoping to have satisfied the wishes of your excellency, I am pleased to reiterate on this occasion the assurance of my very distinguished consideration.

PEDRO I. SAAVEDRA.

His Excellency JOHN BAKER, &c., &c., &c.

CUBA.

UNITED STATES CONSULATE-GENERAL,
Havana, June 19, 1880.

SIR: In reply to instruction No. 505 of the 23d May, 1879, requesting certain information respecting the amount of gold and silver coin and bullion in Cuba, I had the honor to inform the Department, by my dispatch No. 806 of the 6th of June of the same year, that I had given the director general of finances a translation of several interrogatories accompanying the instruction, and that that officer had promised to furnish me with as full information upon the subject as the limited statistical resources of his department would permit.

Up to the present the promised information has not been received, and I have now to acknowledge the receipt of the Department's circular, dated the 30th of April ultimo, transmitting other interrogatories, and to which I append answers based upon the information I have been able to gather from various sources, in the absence of any published data upon the subject.

1st. What is the amount of gold coin and bullion in the treasury, in the banks, and in circulation?

Answer. There is no gold or silver bullion in the island. The amount of gold and silver coin in the treasury should be considered nominal only, consisting of the small balances carried over from day to day; it is well understood that the resources of the treasury of Cuba during the past ten years have been so restricted that it has been without the means to meet many of the most urgent necessities of the government, as, for instance, the payment of the military and naval forces employed in and about the island.

The amount of gold coin in the banks of Havana is given in the bank reports as follows:

December 31, 1879.....	\$8,657,000
March 31, 1880.....	9,849,000
April 30, 1880.....	10,522,000

The amount of gold coin in circulation in the island on the 30th of April ultimo, exclusive of the amount in the banks, is estimated at from \$30,000,000 to \$35,000,000.

2d. What is the amount of silver coin and bullion in the treasury, in the banks, and in circulation?

Answer. It is estimated that the amount of silver coin in the island may be near, but will scarcely exceed, \$1,000,000; in circulation principally in the eastern part of island. There have been considerable importations during the past year of Mexican dollars, but there appears to be great opposition to receiving them into general circulation in sums exceeding \$2.

3d. What is the amount of outstanding paper currency?

Answer. The bills of the Spanish Bank of Havana are the paper currency of Cuba; the amount in circulation on the 30th of April, 1880, was, according to the bank's statement, \$57,857,000, of which \$44,900,000 have been issued for account of the government. This currency is irredeemable, and after the 1st of July, 1880, will not be received for any dues whatever of the government. Its value, on the 30th of April ultimo, relatively with the gold (*peso*) dollar of Cuba, was 44 cents, or about 41 cents in gold coin of the United States.

4th and 5th. What are the amounts of gold and silver produced annually from the mines?

Answer. There are no mines of either gold or silver, although both minerals are known to exist in the island.

6th. What is the amount of gold annually coined, imported, and consumed in the arts and manufactures?

Answer. There is no mint for coinage in Cuba. The specie imported into the island during the past four years is stated to be in round numbers as follows:

1876	\$6,169,000
1877	9,414,000
1878	9,011,000
1879	4,712,000
1880, from January 1 to April 30.....	5,257,000

The data in regard to the amounts exported are very imperfect, but as the greater part of both importations and exportations of coin are of Spanish doubloons, having here a compulsory value of some 7 per cent. more than abroad, and are governed entirely by the rates of foreign exchanges, it may be asserted that the amounts exported and the amounts imported during any year are about equal. For instance, during the years 1878 and 1879, the rates of exchange on New York were frequently as high as 10 per cent. premium; while those rates prevailed, coin was exported; when the rates declined to 5 and 6 per cent. premium, the same coin was sent back to the island. The value of the Spanish doubloon fluctuates in the New York market at from \$15.60 to \$16.25, according to the rates of exchange between Havana and that city.

The amount of coin consumed in the arts cannot be ascertained; it must, however, be very small, there being no important establishment of that nature in the island.

First additional interrogatory. What are the standard coins in circulation, and what denomination of coin is the unit of money of account?

Answer. The standard coins in circulation in Cuba are the gold ounce or doubloon, of \$17 (pesos), and its fractions of half, quarter, eighth, and sixteenth (in the United States Treasury Department's circular of December 20, 1873, the unit of this coin is termed "peso"). A more modern gold coin of Spain of the denomination of \$5 has been recently introduced; it is called the "Isabellino" and "Alfonsino," and is current here at \$5.30.

The silver coins of Spain in circulation or known in Cuba are the dollar (*peso*), the escudo, the peseta fuerte, the real de plata (fuerte), the medio real fuerte, the peseta sencilla, the real sencillo, and the medio real sencillo; the latter is also known as the "real devellon." The unit of the money of account, as established by royal order of the 15th of April, 1848, was the real de plata of $12\frac{1}{2}$ cents, or the eighth of the "peso"; in 1866, the "escudo" of 50 cents, with its millesimal divisions; latterly the "peseta" of 20 cents, a coin of identical value with the French franc, has been adopted. All of the foregoing have appeared at different times in official estimates and in the government's accounts, creating much confusion. But the unit of money of account now generally adopted and recognized by the government of Cuba is the gold dollar (*peso*) of 100 cents, and although silver of Spanish coinage is received at the treasury in whatever amounts presented, it is seldom used except as subsidiary coin and for sums not exceeding \$2.

Second, additional. What is the legal standard of value, gold or silver, or both metals, at fixed rates?

Answer. The legal standard of value is the gold dollar or peso. The fixed values of the different denominations are as follows:

The ounce or doubloon	\$17 00
The half doubloon	8 50
The quarter doubloon	4 25
The eighth doubloon	2 12½
The sixteenth doubloon.....	1 06¼

Third, additional. If both gold and silver are the standard of value, what is the ratio of the two metals in the coinage?

Answer. All the standard coins of Cuba are made in Spain; none in the island.

Fourth, additional. What is the exact standard weight and fineness provided by law for the coin representing the monetary unit; or, if more convenient, the exact content of such coin in pure gold or pure silver?

Answer. The Spanish doubloon or ounce is of the past century. None have been coined since the reign of Ferdinand VII. The weight of those coined since 1785 is represented to be 416.65 grains, troy weight, of 21.2 carat fineness. There are, however, a great many of these ounces that are said to have been coined outside of Spain, and fall greatly short of the above standard.

Fifth, additional. In compliance with this interrogatory, a copy of the royal order of October 13, 1863, governing mining operations, is transmitted herewith.

I have been unable to obtain a copy of the law or royal order fixing the coin standard of Cuba.

Trusting that the answers herewith transmitted will prove satisfactory,

I have the honor to be, sir, your obedient servant,

HENRY C. HALL,
Consul-General.

Hon. WILLIAM M. EVARTS,
Secretary of State, Washington, D. C.

World's production of gold and silver.

[Calendar years except for United States and Japan.]

Countries.	1877.				1878.				1879.			
	Gold.		Silver.		Gold.		Silver.		Gold.		Silver.	
	Kilograms.	Dollars.	Kilograms.	Dollars.	Kilograms.	Dollars.	Kilograms.	Dollars.	Kilograms.	Dollars.	Kilograms.	Dollars.
United States.....	70,565	46,897,390	957,821	39,798,573	77,048	51,206,360	1,088,343	45,281,385	58,531	38,899,858	981,825	40,812,132
Russia.....	40,907	27,226,688	11,255	457,844	42,082	27,967,697	10,778	448,016	*40,000	26,584,000	*10,000	415,676
Austria.....	43,663	29,018,223			*43,663	29,018,223			*43,663	29,018,223		
Mexico.....	11,500	996,898	11,500	996,898	11,500	996,898	1650,000		1,488	989,161	605,469	25,167,763
Germany.....	308	204,697	147,612	6,135,877	309	205,361	166,911	6,938,073	*208	205,361	166,911	6,938,073
Austria.....	*1,800	1,196,278	*1,800	2,119,948	*1,800	1,196,278	*52,000	2,161,515	1,598	1,062,031	48,180	2,002,727
Sweden.....	*4	2,658	1,300	54,038	9	6,001	1,268	52,708	3	1,994	1,502	62,435
Norway.....			4,524	188,052			*4,000	*166,270			*4,000	*166,270
Italy.....	100	72,375	432	17,919			*432	*17,949			*432	*17,949
Rest of Europe.....			*50,000	2,078,380			*50,000	2,078,380			*50,000	2,078,380
Argentina Republic.....			*10,109	*420,225			*10,109	*420,225			10,109	420,225
Colombia.....	*118	*78,546							118	78,546		
Colombia.....	6,019	4,000,000	24,057	1,000,000	6,019	4,000,000	24,057	1,000,000	6,019	4,000,000	24,057	1,000,000
Rest of South America.....	*3,000	1,993,800	*250,000	1,039,190	*3,000	1,993,800	*250,000	1,039,190	*3,000	1,993,800	*250,000	1,039,190
Japan.....	*400	265,840	*17,000	706,649	*445	237,746	17,534	728,846	*3,000	1,993,800	22,046	916,400
Africa.....	*3,000	1,993,800			*3,000	1,993,800						
Total.....	171,453	118,947,173	2,174,610	81,040,665	179,102	119,031,085	2,326,432	87,351,497	158,539	105,365,697	2,174,531	81,037,220

* Estimated from production of other years.

† Estimated from amounts deposited at its mints.

‡ Estimated from Soetbeer's average for 1875.

Average annual production of the precious metals in the world by periods from 1701 to 1875.

[From Dr. Adolph Soetbeer's work on Edelmetall Production.]

Period.	Gold—annual average.		Silver—annual average.		Total annual average value.
	Kilograms.	Value.	Kilograms.	Value.	
1701-'20.....	12,820	\$8,520,300	355,600	\$14,781,500	\$23,301,800
1721-'40.....	19,080	12,680,700	431,200	17,924,100	30,604,800
1741-'60.....	24,610	16,356,000	533,145	22,157,500	38,513,500
1761-'80.....	20,705	13,760,700	652,740	27,127,800	40,888,500
1781-'1800.....	17,790	11,823,400	879,060	36,533,700	48,357,100
1801-'10.....	17,778	12,553,000	894,150	36,960,800	49,513,800
1811-'20.....	11,445	7,606,400	540,770	22,474,000	30,080,400
1821-'30.....	14,216	9,448,800	460,560	19,140,800	28,589,600
1831-'40.....	20,289	13,484,400	596,450	24,788,400	38,272,600
1841-'50.....	54,759	36,393,300	780,415	32,434,000	68,827,300
1851-'55.....	197,515	131,270,000	886,115	36,826,900	168,096,900
1856-'60.....	206,058	136,940,800	904,990	37,611,300	174,552,100
1861-'65.....	185,123	123,030,400	1,101,150	45,763,700	168,794,100
1866-'70.....	191,900	127,538,600	1,339,085	55,654,300	183,192,900
1871-'75.....	170,675	113,432,300	1,969,425	81,849,300	195,281,600

Another estimation (authority not given) places the annual production of gold and silver in the world since 1848 as follows:

Year.	Gold.	Silver.	Total.
1849.....	\$27,100,000	\$39,000,000	\$66,100,000
1850.....	44,450,000	39,000,000	83,450,000
1851.....	67,600,000	40,000,000	107,600,000
1852.....	132,750,000	40,600,000	173,350,000
1853.....	155,450,000	40,600,000	196,050,000
1854.....	127,450,000	40,600,000	168,050,000
1855.....	135,075,000	40,600,000	175,675,000
1856.....	147,600,000	40,650,000	188,250,000
1857.....	133,275,000	40,650,000	173,925,000
1858.....	124,650,000	40,650,000	165,300,000
1859.....	124,850,000	40,750,000	165,600,000
1860.....	119,250,000	40,800,000	160,050,000
1861.....	113,800,000	44,700,000	156,500,000
1862.....	107,750,000	45,200,000	152,950,000
1863.....	106,950,000	49,200,000	156,150,000
1864.....	113,000,000	51,700,000	164,700,000
1865.....	120,200,000	51,950,000	172,150,000
1866.....	121,100,000	50,750,000	171,825,000
1867.....	104,025,000	54,225,000	168,250,000
1868.....	109,725,000	50,225,000	159,950,000
1869.....	106,225,000	47,500,000	153,725,000
1870.....	106,850,000	51,575,000	158,425,000
1871.....	107,000,000	61,050,000	168,050,000
1872.....	99,600,000	65,250,000	164,800,000
1873.....	96,200,000	89,250,000	185,450,000
1874.....	90,750,000	71,500,000	162,250,000
1875.....	97,500,000	80,500,000	178,000,000
1876.....	95,000,000	74,000,000	169,000,000
1877.....	97,000,000	81,000,000	178,000,000
1878.....	86,500,000	73,000,000	160,000,000

Imports and exports of specie in England (from report of Director of Mint for 1779).

GOLD.

The imports of gold were not registered at the custom-house before 1858. The subjoined table shows the imports and exports since then.

GOLD.

Years.	Imports.	Exports.	Excess im-ports.	Excess ex-ports.
1858.....	£22, 793, 126	£12, 567, 040	£10, 226, 086	.....
1859.....	22, 297, 698	18, 081, 139	4, 216, 559	.....
1860.....	12, 584, 684	15, 641, 578	.....	£3, 056, 894
1861.....	12, 163, 937	12, 138, 372	25, 565	.....
1862.....	19, 903, 704	16, 011, 963	3, 891, 741	.....
1863.....	19, 142, 665	15, 303, 279	3, 839, 386	.....
1864.....	16, 900, 951	13, 279, 739	3, 621, 212	.....
1865.....	14, 485, 570	8, 493, 332	5, 992, 238	.....
1866.....	23, 509, 641	12, 742, 059	10, 767, 582	.....
1867.....	15, 800, 159	7, 889, 430	7, 911, 129	.....
1868.....	17, 136, 177	12, 708, 508	4, 427, 869	.....
1869.....	13, 770, 812	8, 473, 699	5, 297, 113	.....
1870.....	18, 806, 728	10, 013, 521	8, 793, 207	.....
1871.....	21, 618, 924	20, 698, 275	920, 649	.....
1872.....	18, 463, 442	19, 148, 916	.....	1, 270, 474
1873.....	20, 611, 165	19, 071, 220	1, 539, 945	.....
1874.....	18, 081, 019	10, 641, 636	7, 439, 383	.....
1875.....	23, 140, 834	18, 648, 296	4, 492, 538	.....
1876.....	23, 475, 975	16, 515, 748	6, 960, 227	.....
1877.....	15, 441, 985	20, 361, 386	.....	4, 919, 401
1878.....	20, 872, 216	14, 968, 507	5, 903, 709	.....
	391, 007, 412	303, 997, 043	96, 266, 138	9, 255, 769
	303, 937, 043		9, 255, 769	
Excess imports	87, 010, 369	.....	87, 010, 369	

SILVER.

The imports of silver were not registered at the custom-house before 1858. The subjoined table shows the imports and exports since then.

SILVER.

Years.	Imports.	Exports.	Excess im-ports.	Excess ex-ports.
1858.....	£6, 700, 064	£7, 061, 836	.....	£361, 772
1859.....	14, 772, 458	17, 607, 664	.....	2, 835, 206
1860.....	10, 393, 512	9, 893, 190	£500, 322	.....
1861.....	6, 583, 108	9, 573, 276	.....	2, 990, 168
1862.....	11, 752, 772	13, 314, 228	.....	1, 561, 456
1863.....	10, 888, 129	11, 240, 671	.....	352, 542
1864.....	10, 827, 325	9, 852, 561	974, 764	.....
1865.....	6, 976, 641	6, 599, 192	377, 449	.....
1866.....	10, 777, 498	8, 896, 552	1, 880, 946	.....
1867.....	8, 020, 888	6, 435, 487	1, 585, 401	.....
1868.....	7, 716, 418	7, 511, 706	204, 712	.....
1869.....	6, 730, 179	7, 903, 829	.....	1, 173, 650
1870.....	10, 648, 940	8, 906, 169	1, 742, 771	.....
1871.....	16, 521, 703	13, 062, 396	3, 459, 507	.....
1872.....	11, 138, 570	10, 586, 945	551, 625	.....
1873.....	12, 988, 066	9, 828, 065	3, 160, 001	.....
1874.....	12, 298, 169	12, 211, 957	86, 212	.....
1875.....	10, 123, 955	8, 979, 746	1, 144, 209	.....
1876.....	13, 578, 269	12, 948, 334	629, 935	.....
1877.....	21, 710, 884	19, 436, 173	2, 274, 081	.....
1878.....	11, 549, 274	11, 718, 039	.....	168, 765
	232, 696, 972	223, 568, 576	18, 571, 935	9, 443, 539
	223, 568, 576		9, 443, 539	
Excess imports	9, 128, 396	.....	9, 128, 396	

[From the Report of the Director of the Mint for 1879.]

Statement of French importations and exportations of gold.

Years.	Importation.		Exportation.	
	Unwrought gold.	Coined gold.	Unwrought gold.	Coined gold.
	<i>Francs.</i>	<i>Francs.</i>	<i>Francs.</i>	<i>Francs.</i>
1850.....	29,753,000	31,282,000	31,554,000	12,492,000
1851.....	22,241,000	93,585,000	14,389,000	16,835,000
1852.....	19,234,000	39,947,000	10,941,000	31,332,000
1853.....	261,232,000	57,555,000	5,434,000	24,294,000
1854.....	368,190,000	112,505,000	8,602,000	55,971,000
1855.....	274,783,000	106,127,000	4,869,000	157,798,000
1856.....	272,995,000	192,006,000	588,000	89,160,000
1857.....	290,483,000	278,209,000	3,318,000	119,552,000
1858.....	252,551,000	301,013,000	1,365,000	65,094,000
1859.....	358,098,000	368,712,000	5,230,000	182,237,000
1860.....	279,017,000	191,461,000	31,437,000	127,342,000
1861.....	17,297,000	226,740,000	57,822,000	209,949,000
1862.....	119,011,000	282,816,000	41,457,000	195,332,000
1863.....	83,266,000	286,467,000	86,118,000	271,639,000
1864.....	110,098,000	353,898,000	32,811,000	306,043,000
1865.....	96,243,000	323,157,000	55,305,000	213,271,000
1866.....	169,492,000	643,811,000	67,574,000	280,477,000
1867.....	224,873,000	368,750,000	43,033,000	141,925,000
1868.....	200,366,000	293,079,000	29,419,000	251,163,000
1869.....	156,596,000	298,000,000	56,002,000	144,260,000
1870.....	69,184,000	241,158,000	99,420,000	91,156,000
1871.....	7,830,000	136,032,000	2,546,000	355,130,000
1872.....	18,544,000	123,318,000	6,173,000	188,581,000
1873.....	37,527,000	138,067,000	7,880,000	276,403,000
1874.....	127,848,000	389,197,000	3,006,000	82,789,000
1875.....	211,768,000	396,246,000	25,819,000	111,875,000
1876.....	96,688,000	501,619,000	2,635,000	92,020,000
1877.....	83,327,000	451,370,000	2,226,000	76,735,000
1878.....	113,365,000	251,011,000	17,477,000	110,495,000

Statement of French silver importations and exportations.

Years.	Importation.		Exportation.	
	Unwrought silver.	Coined silver.	Unwrought silver.	Coined silver.
	<i>Francs.</i>	<i>Francs.</i>	<i>Francs.</i>	<i>Francs.</i>
1850.....	24,648,000	130,245,000	10,475,000	71,834,000
1851.....	20,635,000	157,995,000	33,007,000	67,674,000
1852.....	21,855,000	158,273,000	28,089,000	154,486,000
1853.....	16,572,000	95,997,000	40,982,000	188,472,000
1854.....	12,221,000	87,627,000	72,451,000	191,091,000
1855.....	42,925,000	77,966,000	76,673,000	241,378,000
1856.....	11,631,000	98,265,000	139,192,000	254,327,000
1857.....	18,336,000	79,933,000	152,044,000	306,045,000
1858.....	15,536,000	145,099,000	97,780,000	77,795,000
1859.....	12,176,000	198,361,000	190,537,000	191,523,000
1860.....	12,021,000	118,584,000	145,797,000	142,051,000
1861.....	20,485,000	151,695,000	79,920,000	154,073,000
1862.....	27,496,000	103,939,000	116,051,000	101,565,000
1863.....	27,565,000	133,435,000	126,124,000	103,217,000
1864.....	63,416,000	204,316,000	134,107,000	176,099,000
1865.....	93,633,000	142,504,000	93,131,000	70,420,000
1866.....	74,562,000	175,490,000	111,517,000	93,570,000
1867.....	70,456,000	183,925,000	45,773,000	18,959,000
1868.....	64,010,000	129,047,000	26,979,000	56,803,000
1869.....	63,524,000	129,290,000	36,872,000	44,517,000
1870.....	32,108,000	73,932,000	25,510,000	45,063,000
1871.....	46,729,000	110,462,000	17,972,000	123,703,000
1872.....	54,347,000	186,527,000	16,232,000	122,392,000
1873.....	201,868,000	187,166,000	14,889,000	192,647,000
1874.....	86,892,000	347,523,000	23,935,000	49,546,000
1875.....	100,834,000	165,949,000	30,663,000	50,777,000
1876.....	56,911,000	148,280,000	19,566,000	45,270,000
1877.....	35,708,000	112,448,000	10,106,000	32,090,000
1878.....	57,512,000	121,532,000	8,190,000	52,020,000

Annual export of silver to India and China from 1873 to 1878, inclusive.

Period.	From Europe (calendar years)†	From the United States (fiscal years).‡	Total.
1873	\$12,489,880	\$5,395,133	\$17,885,013
1874	35,463,630	6,839,207	42,302,837
1875	18,572,020	5,878,420	24,450,440
1876	54,572,035	4,543,750	59,115,785
1877	85,037,290	12,155,525	97,192,815
1878	29,222,885	15,624,490	44,847,375
1879	22,328,495	7,135,620	29,464,115
July 1 to September 30, 1879		1,789,412	1,789,412
Total	257,686,235	59,361,557	317,047,792

Of the amount exported from the United States, \$13,352,304 was in the form of foreign coin and bullion.

* To September 30, 1879, three months ending.

† From Pixley and Abell's circulars.

‡ Reports Bureau of Statistics.

Values of imports and exports into India for years 1866-'67 to 1877-'78.

[From London Economist, October 18, 1879.]

Years.	Merchandise.					
	Imports.		Exports.		Total.	
	Value.		Value.		Value.	
	<i>Rupees.</i>	<i>Per ct.</i>	<i>Rupees.</i>	<i>Per ct.</i>	<i>Rupees.</i>	<i>Per ct.</i>
1866-'67 (eleven months)	290,147,313	41	418,559,941	59	708,747,354	100
1867-'68	356,643,206	41	508,740,563	59	865,383,769	100
1868-'69	359,313,740	40	530,621,647	60	889,935,387	100
1869-'70	328,796,432	39	524,713,756	61	853,510,188	100
1870-'71	353,482,462	38	553,818,252	62	886,800,714	100
1871-'72	308,107,756	43	631,858,484	67	939,966,240	100
1872-'73	304,730,694	36	552,363,950	64	857,093,644	100
1873-'74	316,284,972	37	549,607,861	63	865,892,833	100
1874-'75	346,452,622	38	563,122,605	62	909,575,227	100
1875-'76	371,126,672	39	580,454,046	61	951,580,718	100
1876-'77	353,671,766	37	609,616,320	63	963,288,086	100
1877-'78	393,260,030	38	651,857,132	62	1,045,117,162	100

Years.	Total, including treasure.					
	Imports.		Exports.		Total.	
	Value.		Value.		Value.	
	<i>Rupees.</i>	<i>Per ct.</i>	<i>Rupees.</i>	<i>Per ct.</i>	<i>Rupees.</i>	<i>Per ct.</i>
1866-'67 (eleven months)	422,442,736	49	438,104,291	51	860,547,027	100
1867-'68	474,396,946	48	518,993,930	52	993,390,876	100
1868-'69	502,979,618	43	538,382,466	52	1,041,362,084	100
1869-'70	468,344,504	47	534,967,614	53	1,003,312,118	100
1870-'71	387,930,693	41	569,190,051	59	957,120,744	100
1871-'72	428,845,885	40	646,070,209	60	1,069,916,094	100
1872-'73	350,296,544	38	565,102,740	62	915,399,284	100
1873-'74	374,210,308	40	568,398,572	60	942,608,880	100
1874-'75	427,863,088	43	579,049,819	57	1,006,912,907	100
1875-'76	424,133,896	41	601,605,488	59	1,025,739,384	100
1876-'77	468,032,946	42	649,042,118	58	1,117,075,064	100
1877-'78	566,814,626	46	673,408,488	54	1,240,223,114	100

The rupee is equivalent to 44.4 cents United States money.

Table showing the imports and exports of silver bullion and coin from the 1st of January, 1878 (passage of the standard-dollar bill, 28th of February, 1878), to the 30th of September, 1880.

[Compiled from official returns as published in the *Économiste Français* and *London Economist*.]

FRANCE.

[The hectogram reduced at \$4.]

BULLION.

Countries.	IMPORTS.		
	1878—12 months.	1879—12 months.	1880—9 months.
Great Britain.....	\$7, 117, 960	\$1, 102, 240	\$582, 020
Belgium.....	876, 560	183, 736	296, 880
Italy.....	496, 160	282, 384	296, 036
Other countries.....	4, 648, 240	3, 720, 772	2, 501, 704
	13, 138, 920	5, 289, 132	3, 676, 640

Countries.	EXPORTS.		
	1878—12 months.	1879—12 months.	1880—9 months.
Great Britain.....	\$1, 118, 964	\$4, 661, 560	\$1, 605, 400
British India.....	70, 160	530, 400	592, 000
China.....	50, 000	-----	49, 400
Other countries.....	1, 106, 956	1, 221, 600	983, 200
	2, 346, 080	6, 413, 560	3, 230, 000

COIN.

[Probably marketable silver in its majority.]

Countries.	IMPORTS.		
	1878—12 months.	1879—12 months.	1880—9 months.
Great Britain.....	\$4, 439, 800	\$3, 970, 240	\$1, 192, 168
Mexico.....	6, 307, 600	6, 230, 200	2, 763, 525
	10, 747, 400	10, 200, 440	3, 955, 693

Countries.	EXPORTS.		
	1878—12 months.	1879—12 months.	1880—9 months.
Great Britain.....	\$8, 995, 784	\$9, 053, 080	\$5, 781, 000
British India.....	208, 416	57, 480	419, 060
China.....	481, 880	1, 133, 000	314, 600
	9, 686, 080	10, 243, 560	6, 514, 660

Table showing the imports and exports of silver bullion and coin, &c.—Continued.

COIN.

[Probably French and other coins, not marketable, in their majority.]

Countries.	IMPORTS.		
	1878—12 months.	1879—12 months.	1880—9 months.
Germany	\$772, 600	\$382, 684	\$228, 320
Spain	262, 560	228, 116	113, 404
Belgium	9, 691, 720	10, 559, 604	3, 089, 880
Italy	2, 717, 440	2, 828, 224	4, 705, 360
Other countries	7, 542, 040	8, 284, 564	6, 178, 572
	20, 986, 360	22, 283, 192	14, 315, 536

Countries.	EXPORTS.		
	1878—12 months.	1879—12 months.	1880—9 months.
Spain	\$1, 348, 496	\$135, 240	\$75, 920
Belgium	965, 940	701, 600	472, 880
Italy	92, 260	44, 440	86, 090
Switzerland	1, 640, 956	2, 762, 720	1, 120, 760
Greece	88, 416	8, 360	327, 800
Other countries	4, 011, 100	2, 475, 840	2, 684, 720
	8, 147, 168	6, 123, 200	4, 768, 080

RECAPITULATION.

[Marketable silver.]

	1878—12 months.	1879—12 months.	1880—9 months.
Imports, bullion	\$13, 138, 920	\$5, 289, 132	\$3, 676, 640
Imports, coin	10, 747, 400	10, 200, 440	3, 955, 693
Net exports	23, 886, 320	16, 657, 120	9, 744, 660
Exports, bullion	2, 346, 080	6, 413, 560	3, 230, 000
Exports, coin	9, 686, 080	10, 243, 560	6, 514, 660
Net imports	11, 854, 160		
	23, 886, 320	16, 657, 120	9, 744, 660

BALANCE.

[Marketable silver.]

Net imports, 1878	\$11, 854, 160	
Net exports, 1879		\$1, 167, 548
Net exports, 1880 (nine months)		2, 112, 327
Net imports (entire period)		8, 574, 285
	11, 854, 160	11, 854, 160

Table showing the imports and exports of silver bullion and coin, &c.—Continued.

GREAT BRITAIN.

[The pound sterling reduced at \$5.]

Countries.	IMPORTS.		
	1878—12 months.	1879—12 months.	1880—9 months.
Germany	\$19,997,010	\$3,920,670	\$1,389,185
France	8,703,285	11,732,920	8,090,960
Mexico, South America, and West Indies ...	17,599,235	17,824,945	9,259,960
Brazil	140,205	1,003,750	662,445
United States	8,079,640	12,981,145	3,525,985
British India	683,400	630,620	592,415
China	7,245	1,744,540	99,690
Holland	273,365	43,720	23,685
Spain, Canaries, Portugal, and Madeira	205,420	1,230,830	93,010
Other countries	2,057,565	2,553,295	1,066,725
Net exports	57,746,370	53,671,435	24,804,060
	843,825	1,484,035	3,951,385
	58,590,195	55,155,470	28,755,445

Countries.	EXPORTS.		
	1878—12 months.	1879—12 months.	1880—9 months.
Germany	\$7,369,380	\$8,616,255	\$947,005
France	10,944,385	3,613,415	675,500
Mexico, South America, and West Indies ...	196,380	2,975,105	627,275
Brazil		2,500	
United States	5,414,100	3,071,600	116,950
British India	21,097,065	30,232,800	19,134,200
China	8,103,780	2,637,460	4,767,285
Holland	626,220	673,055	701,305
Spain, Canaries, Portugal, and Madeira	3,644,800	1,396,330	42,855
Other countries	1,194,085	1,936,950	1,743,070
	58,590,195	55,155,470	28,755,445

BALANCE.

[Against three previous years.]

Net exports, 1878	\$843,825	Net imports, 1875	\$5,721,045
Net exports, 1879	1,484,035	Net imports, 1876	3,149,675
Net exports, 1880 (nine months)	3,951,385	Net imports, 1877	11,370,415
	6,279,245		20,241,135

Table showing the combined net movement of marketable silver in France and Great Britain since January 1, 1878, to September 30, 1880.

SUPPLY.

NET RECEIPTS FROM STEADY SOURCES.

Countries.*	1878—12 months.	1879—12 months.	1880—9 months.
Mexico, South America, and West Indies in Great Britain	\$17,402,855	\$14,849,840	\$8,632,685
Mexico in France	6,307,600	6,230,200	2,763,525
Other countries in France (bullion probably from South America in its majority)	3,541,284	2,499,172	1,518,504
United States in Great Britain	2,665,540	9,909,545	3,409,035
Brazil in Great Britain	140,205	1,006,250	662,445
	30,057,484	34,495,007	16,986,194

* Germany and Austria as producing countries do not materially count beyond their combined manufacturing demand.

Table showing the combined net movement of marketable silver, &c.—Continued.

NET RECEIPTS FROM CASUAL SOURCES.

Countries.	1878—12 months.	1879—12 months.	1880—9 months.
Germany in Great Britain	\$12, 627, 630	.....	\$442, 180
Spain in Great Britain .....	.....	.....	50, 155
Other countries in Great Britain	863, 480	\$616, 345	.....
Belgium and Italy in France (bullion)	1, 372, 720	466, 120	592, 916
	14, 863, 830	1, 082, 465	1, 085, 251

DEMAND.

NET EXPORTS TO STEADY CONSUMERS.

	1878—12 months.	1879—12 months.	1880—9 months.
British India from Great Britain	\$20, 413, 665	\$29, 602, 180	\$18, 541, 785
British India from France	273, 576	587, 880	1, 011, 060
China from Great Britain	8, 096, 535	892, 920	4, 667, 595
China from France	531, 880	1, 133, 000	364, 000
Holland (probably for Asia) from Great Britain.	352, 855	629, 335	677, 620
	29, 673, 511	32, 845, 315	25, 262, 060

NET EXPORTS TO CASUAL CONSUMERS.

Spain from Great Britain	\$3, 439, 380	\$165, 500	.....
Other countries from Great Britain .....	.....	.....	\$676, 345
Germany from Great Britain .....	.....	4, 695, 585	.....
	3, 439, 380	4, 861, 085	676, 345

RECAPITULATION.

Supply, ordinary	\$30, 057, 684	\$34, 495, 007	\$16, 986, 194
Supply, casual	14, 863, 830	1, 082, 465	1, 095, 251
	44, 921, 514	35, 577, 472	18, 081, 445
Demand, Asiatic	29, 672, 631	32, 845, 315	25, 262, 060
Demand, casual	3, 439, 380	4, 861, 085	676, 345
	33, 112, 011	37, 706, 400	25, 938, 405
Great Britain's tables show:			
Net exports to France	2, 241, 100	.....	.....
Net imports from France .....	.....	8, 019, 505	7, 415, 460
France's tables show:			
Net exports to Great Britain .....	.....	8, 642, 160	5, 612, 212
Imports from Great Britain	1, 443, 012	.....	.....

The difference between the higher valuation of France compared with that of Great Britain explains the variation for 1878 and 1879, without possible floating stocks, recorded in one and not the other country.

Table showing the sources of supply and demand of the international movement of silver (*Latin Union coins not considered*), since the 1st of January, 1878, to the 30th of September, 1880.

[Compiled from the combined returns of Great Britain, France, and the United States.]

ORDINARY SUPPLY.

	1878 (12 months).	1879 (12 months).	1880 (9 months).
Mexico and South America:			
Receipts in the United States of foreign silver, bullion, and coin	\$14, 942, 310	\$8, 599, 442	\$6, 430, 366
Imports from Great Britain	5, 414, 100	(Trade-dollars.)	(Trade-dollars.)
Mostly from Mexico	9, 528, 210	8, 599, 442	6, 430, 366
Gross receipts in Great Britain	17, 599, 235	17, 824, 945	9, 529, 960
Receipts in France from Mexico	6, 307, 600	6, 230, 200	2, 763, 500
Gross receipts in France from other countries (bullion only)	4, 618, 240	3, 720, 772	2, 501, 704
Brazil:			
Receipts in Great Britain	Assumed beyond its own consumption.	\$38, 083, 285	\$30, 375, 359
Germany:			
Gross receipts in Great Britain	140, 205	Assumed beyond its own consumption.	1, 005, 000
United States:	2, 000, 000		{ Positive re- ceipts. }
Estimated production (Valentine)	37, 248, 137		
Total receipts from producing countries	77, 471, 637	37, 032, 857	28, 500, 000
		76, 413, 216	51, 777, 160

ORDINARY DEMAND.

	[Exclusive of United States coinage.]		
British India:			
Net shipments from Great Britain	\$20, 413, 665	\$29, 602, 180	\$18, 541, 785
Shipments of bullion from France	70, 160	530, 400	592, 000
Shipments of coin from France	208, 416	57, 430	419, 060
Shipments from Venice		2, 220, 000	3, 775, 000
China and Japan:			
Net shipments from Great Britain	8, 096, 535	892, 920	4, 667, 535
Shipments of bullion from France	50, 000		49, 400
Shipments of coin from France	481, 880	1, 133, 000	314, 600
Shipments from San Francisco	9, 000, 000	8, 500, 000	2, 521, 067
Holland:			
Net receipts from Great Britain, probably for its Asiatic colonies	17, 628, 415	10, 525, 920	7, 552, 662
	352, 855	629, 830	677, 620

\$23, 227, 845

Table showing the sources of supply and demand of the international movement of silver, &c.—Continued.

ORDINARY DEMAND—Continued.

	1878 (12 months).	1879 (12 months).	1880 (9 months).
Central and South America (including West Indies): Assumed ordinary demand of non-producing portions from the United States, Great Britain, and France			
Great Britain: Assumed ordinary annual demand for manufacturing	\$500,000	\$500,000	\$375,000
France: Assumed ordinary annual demand for manufacturing	3,000,000	3,000,000	2,250,000
Austria: Assumed ordinary annual demand for manufacturing beyond its own production	3,000,000	3,000,000	2,250,000
Spain: Assumed ordinary annual demand for manufacturing beyond its own production	1,250,000	1,250,000	(Positive ship- ments.)
Italy: Assumed ordinary annual demand for manufacturing	1,000,000	1,000,000	750,000
United States: Assumed ordinary annual demand for manufacturing	1,000,000	1,000,000	750,000
Other countries: Shipments from France (bullion only)	5,000,000	5,000,000	3,750,000
	1,108,956	1,221,600	983,200
Total ordinary demand	54,536,467	59,536,910	43,613,332

EXTRAORDINARY SUPPLY.

			(See ordinary supply.)
Germany: Gross receipts in Great Britain	\$19,997,010	\$3,920,670	.....
Assumed as receipts from the surplus of its production beyond the manufacturing demand of Germany	2,000,000	2,000,000	.....
	\$17,997,010	\$1,920,670	.....
Spain: Net receipts in Great Britain	1,000,000	1,000,000	\$50,155
Assumed annual consumption	876,560	1,000,000	750,000
Belgium: Bullion receipts in France, probably reshipments or old stock		183,736	.....
Italy: Bullion receipts in France, probably reshipments or old stock	496,160	282,384	296,036
Assumed annual demand	1,000,000	1,000,000	750,000
	1,496,160	1,282,384	.....
			\$800,155
			296,880
			1,046,036

Central and South America (including West Indies): Gross receipts of United States coin in the United States.....	4, 447, 574 7, 245	4, 440, 329	5, 825, 575 1, 744, 540	1, 767, 094 99, 690	1, 667, 404
Return of trade-dollars from China via Great Britain.....					
Austria: Shipments from Venice to Asia.....		(None.)	(See demand.)		3, 775, 000
Other countries: Gross receipts in Great Britain.....		2, 037, 565		2, 553, 295	1, 066, 725
Total extraordinary supply.....		27, 897, 624		11, 021, 120	8, 632, 200

EXTRAORDINARY DEMAND.

[Including United States coinage.]

	1878 (12 months).		1879 (12 months).		1880 (9 months).	
Austria: Shipments from Great Britain to Germany.....	\$1, 250, 000	\$7, 369, 380	\$1, 250, 000	\$8, 616, 255	\$947, 005	(See extraor- dinary sup- ply.)
Assumed manufacturing demand.....			2, 220, 000	3, 470, 000	3, 775, 000	
Shipments from Asia to Venice.....		1, 250, 000				
Central and South America (including West Indies): Considered as an offset { Shipments from Great Britain.....		196, 380		2, 975, 105		
of returns of Ameri- { Shipments from United States.....		1, 120, 612		229, 407		
can coin.....		1, 825, 992		3, 204, 512		
Less ordinary demand.....		500, 000		500, 000		
Spain: Net receipts from Great Britain.....			825, 992		2, 704, 512	\$1, 809, 211 (See extraor- dinary sup- ply.)
United States: Net receipts of American coin.....			3, 439, 380			
Net receipts of subsidiary money.....		2, 270, 873		4, 753, 343		
Coinage of subsidiary money.....		2, 000, 000				
Coinage of standard dollars.....		22, 495, 550		27, 560, 100		
Other countries: Shipments from Great Britain.....		26, 766, 423			32, 313, 443	\$21, 845, 055
Total extraordinary demand.....		1, 104, 085			1, 936, 950	1, 743, 070
		38, 345, 260			42, 266, 660	25, 397, 336

Coinage in England.

The amount of gold and silver, also copper, annually coined was—

Years.	Gold.	Silver.	Copper.
1858	£1, 231, 023	£445, 986	£13, 440
1859	2, 649, 509	647, 064	8, 512
1860	3, 121, 709	218, 403	37, 990
1861	8, 191, 170	209, 484	273, 578
1862	7, 836, 413	148, 518	352, 800
1863	6, 997, 212	161, 172	158, 648
1864	9, 535, 597	535, 194	58, 969
1865	2, 367, 614	501, 732	57, 493
1866	5, 076, 676	493, 416	50, 624
1867	496, 397	193, 842	33, 301
1868	1, 653, 384	301, 356	16, 328
1869	7, 372, 204	76, 423	20, 832
1870	2, 313, 384	336, 793	32, 704
1871	9, 919, 656	701, 514	7, 616
1872	15, 261, 442	1, 423, 836	47, 413
1873	3, 384, 500	1, 081, 674	46, 218
1874	1, 461, 565	890, 604	65, 632
1875	243, 264	594, 000	69, 813
1876	4, 696, 648	222, 354	61, 450
1877	981, 468	407, 882	51, 146
1878	2, 132, 245	614, 426	.....

The gold sent to the mint is coined, without charge, into sovereigns and half-sovereigns at the rate of £3 17s. 10½d. per ounce. Practically, however, the Bank of England is the mint's only customer. The bank by its charter is obliged to purchase the gold at £3 17s. 9d. per ounce; and importers prefer to so dispose of it, rather than await the time occupied in the process of coinage.

Coinages of various countries.

(Calendar years, with the exception of Japan.)

[Foreign coins converted into United States money at the values estimated by the Director of the Mint, January 1, 1880.]

Countries.	1877.		1878.		1879.	
	Gold.	Silver.	Gold.	Silver.	Gold.	Silver.
United States	\$43, 999, 864	\$28, 393, 045	\$49, 786, 052	\$28, 518, 850	\$39, 080, 080	\$27, 568, 235
Mexico	695, 750	21, 415, 128	691, 998	22, 084, 203	658, 206	22, 162, 987
Colombia	334, 720	157, 273	58, 320	309, 973	.....	.....
Central America	20, 845	302	.....	.....	.....	.....
Great Britain	4, 776, 314	2, 048, 543	10, 376, 571	2, 990, 104	170, 571	2, 671, 971
Australia	15, 168, 881	.....	16, 998, 684	.....	20, 210, 574	.....
India	.....	30, 518, 415	760, 927	78, 741, 556	.....	40, 551, 984
Germany	26, 784, 401	7, 210, 788	29, 742, 879	1, 562, 463	11, 043, 120	.....
Austria	3, 725, 861	8, 036, 093	2, 000, 563	13, 906, 258	1, 001, 592	12, 869, 784
France	49, 249, 960	3, 177, 607	35, 766, 393	351, 534	5, 494, 834	.....
Belgium	22, 797, 430	.....	9, 863, 844	.....	.....	.....
Italy	954, 956	3, 474, 000	1, 224, 639	1, 737, 000	565, 355	3, 860, 000
Netherlands	4, 483, 341	58, 160	199, 250	58, 160	2, 403, 223	44, 806
Russia	26, 432, 484	5, 265, 030	27, 564, 735	5, 974, 170	.....	.....
Denmark	.....	.....	.....	.....	*9, 314, 143	*4, 863, 725
Norway	259, 858	356, 317	744, 352	172, 381	.....	.....
Sweden	1, 147, 099	300, 035	1, 317, 555	252, 397	.....	.....
Portugal	89, 100	53, 460	293, 762	10, 746	262, 451	396, 954
Japan	690, 602	3, 895, 136	596, 087	4, 522, 118	509, 942	2, 327, 847
Total	201, 616, 468	114, 359, 332	188, 386, 611	161, 191, 913	90, 714, 091	117, 318, 293

*Coinage for 1876, 1877, and 1878, to March 31, 1879.

Table showing the specie and paper circulation in France from 1850 to 1878, together with comparative price of exports and imports for the years stated on the basis of prices for the same commodities in the year 1862.

[Compiled from official data contained in the reports of the Director of the Mint.]

Year.	Gold circulation.	Silver circulation.	Paper circulation.	Specie (gold and silver) circulation.	Total specie and paper circulation.	Fluctuation in price of imports. ^a	Fluctuation in price of exports. ^a	Average of imports and exports.
1850.	<i>Francs.</i> 2,126,007,000	<i>Francs.</i> 3,226,146,000	<i>Francs.</i> 511,900,000	<i>Francs.</i> 5,452,753,000	<i>Francs.</i> 5,964,653,000	82	91	86.5
1851.	2,121,209,000	3,404,105,000	602,000,000	5,615,314,000	6,218,214,000	80	85	80
1852.	2,228,117,000	3,401,638,000	672,000,000	5,629,775,000	6,301,775,000	81	98	89.5
1853.	2,517,173,000	3,284,773,000	632,000,000	5,801,949,000	6,433,949,000	81	109	98.5
1854.	2,983,298,000	3,124,079,000	628,300,000	6,064,377,000	6,682,677,000	91	108	99.5
1855.	3,117,634,000	2,907,926,000	592,800,000	6,013,560,000	6,617,340,000	95	104	99.5
1856.	3,457,084,000	2,691,926,000	588,100,000	6,067,010,000	6,650,110,000	106.5	111.5	109
1857.	3,854,081,000	2,241,613,000	532,300,000	6,098,394,000	6,638,594,000	105	110	107.5
1858.	4,296,162,000	2,220,184,000	687,300,000	6,516,336,000	7,203,636,000	92	102	97
1859.	4,794,943,000	2,041,270,000	678,500,000	6,835,710,000	7,514,713,000	93	109	102
1860.	5,060,347,000	1,875,403,000	747,200,000	6,935,750,000	7,682,950,000	98	105	101.5
1861.	4,991,698,000	1,803,370,000	715,800,000	6,795,068,000	7,510,868,000	99	99	99
1862.	5,167,349,000	1,702,110,000	781,600,000	6,893,459,000	7,510,868,000	102.5	100.8	101.6
1863.	5,066,410,000	1,624,880,000	734,900,000	6,691,290,000	7,446,190,000	104.5	101.3	102.6
1864.	5,141,274,000	1,574,297,000	722,300,000	6,713,571,000	7,437,871,000	99.2	97.8	98.5
1865.	5,243,596,000	1,638,720,000	870,700,000	7,335,936,000	8,272,836,000	93.5	91.5	92.5
1866.	5,670,670,000	1,677,266,000	936,300,000	7,335,936,000	8,272,836,000	87	87	88.5
1867.	6,021,955,000	1,856,066,000	1,122,600,000	7,878,621,000	8,901,221,000	83.5	83.5	85.3
1868.	6,167,686,000	1,959,651,000	1,382,800,000	8,147,337,000	9,530,137,000	86.6	84.7	85.7
1869.	6,413,131,000	2,066,373,000	1,395,600,000	8,481,504,000	9,880,104,000	89.3	81.4	87.6
1870.	6,500,000,000	2,100,000,000	1,395,600,000	8,600,000,000	10,000,000,000	93.9	81.4	87.6
1871.	6,536,154,000	2,110,140,000	2,325,400,000	8,368,294,000	10,691,694,000	97.3	83.3	90.3
1872.	6,154,950,000	2,200,302,000	2,636,300,000	8,335,832,000	11,012,132,000	96.1	80.3	88.2
1873.	6,005,897,000	2,367,490,000	2,807,700,000	8,373,387,000	11,181,087,000	86.1	80.3	88.2
1874.	6,392,895,000	2,723,329,000	2,644,800,000	9,116,224,000	11,761,024,000	83.9	76.6	80.2
1875.	6,816,953,000	2,901,494,000	2,438,000,000	9,718,447,000	12,156,447,000	86.7	73.8	80.2
1876.	7,276,060,000	3,025,414,000	2,562,700,000	10,301,474,000	12,864,174,000	87.5	73.9	81.7
1877.	7,687,171,000	3,115,574,000	2,468,300,000	10,802,745,000	13,271,043,000	83.2	72.9	79
1878.	7,869,490,000	3,218,158,000	2,207,300,000	11,087,648,000	13,294,948,000	78.8	67.3	73

^a Journal of the Statistical Society, December, 1879, p. 853. * War with Russia. † Comparison made on basis of 100 in 1862.
before the select committee of Parliament on depreciation of silver, estimated the quantity of gold money present before 1871 at £250,000,000; full legal-tender silver £70,000,000, and subsidiary change £14,000,000. (Report of committee, p. 56.)

Circulation.

[Estimated from official reports and other authorities.

Where no reference is given the statement is from official papers printed in Reports of the Director of the Mint.]

Countries.	Population.		Date for which circulation is stated.	Paper.	Specie.			Total paper and specie.	Per capita.		
	Year.	Latest census or estimate.			Gold.	Silver, full legal tender.	Silver, limited tender.		Paper.	Specie.	Circulation.
United States.....	1880	49,500,000	Nov. 1, 1880	\$697,757,809	\$375,323,881	\$72,847,750	\$79,420,794	\$527,001,425	\$14 10	\$10 66	\$24 76
Great Britain.....	1871	31,028,338	Sept. 28, 1880	2,292,075,227	590,019,751	.....	32,546,231	688,965,952	6 39	21 77	28 16
Canada.....	1880	*4,075,000	Mar. 31, 1880	33,296,440	6,291,255	.....	4,000,000	610,291,285	8 16	22 75	10 68
Australia.....	1880	*2,603,000	June 30, 1880	290,109,088	60,821,147	.....	.....	160,821,147	7 72	23 55	31 07
India.....	1871	190,662,623	Mar. 31, 1880	49,060,176	.....	1,015,000,000	.....	d1,015,000,000	26 18	5 82	5 58
Germany.....	1875	42,727,300	Oct. 30, 1880	221,388,914	333,200,000	109,480,000	101,626,000	f545,306,000	5 18	12 74	17 92
France.....	1876	36,995,788	Nov. 4, 1880	401,154,400	927,000,000	540,780,000	57,900,000	1,525,086,000	12 50	41 34	53 84
Belgium.....	1876	5,336,185	Oct. 28, 1880	260,033,144	43,000,000	55,438,000	8,562,000	g107,000,000	11 25	20 05	31 30
Netherlands.....	1876	2,753,854	Oct. 30, 1880	12,057,083	20,000,000	10,000,000	4,700,000	h34,700,000	6 20	12 60	18 80
Switzerland.....	1879	1,679,775	June —, 1879	12,890,000	4,500,000	.....	3,000,000	i37,500,000	7 70	4 46	12 16
Italy.....	1880	*27,769,475	Sept. 30, 1879	35,788,724	24,000,000	20,900,000	13,000,000	57,900,000	11 37	2 08	13 45
Austria.....	1869	35,004,435	Dec. 31, 1879	259,682,597	43,000,000	37,000,000	.....	180,000,000	373,688,597	2 22	7 45
Sweden.....	1876	4,429,713	Dec. 31, 1879	21,637,372	7,158,000	.....	4,523,616	11,681,616	4 50	2 64	7 53
Norway.....	1875	1,806,000	Dec. 31, 1878	8,299,343	3,236,366	.....	1,721,900	13,256,009	4 59	2 74	7 33
Denmark.....	1870	1,912,142	Dec. 31, 1879	13,028,000	9,316,000	.....	4,863,000	14,173,000	9 34	7 41	17 35
Netherlands.....	1869	3,579,529	Nov. 6, 1880	280,268,041	20,000,000	57,000,000	380,000	77,880,000	22 42	21 78	40 29
Russia.....	1876	86,952,347	Sept. —, 1880	778,514,300	130,000,000	40,000,000	.....	1115,000,000	138,248,041	1 82	10 29
Spain.....	1877	16,625,869	Aug. 31, 1880	441,394,449	5,023,360	30,000,000	.....	2200,000,000	893,514,300	2 48	14 51
Portugal.....	1875	4,441,037	Jan. 1, 1879	5,023,360	48,000,000	12,000,000	.....	650,000,000	241,394,449	1 13	15 77
Turkey.....	1880	*21,000,000	Mar. 31, 1880	21,871,289	10,000,000	40,000,000	.....	15,589,858	65,023,360	71	1 71
Mexico.....	1879	9,276,079	Nov. —, 1879	21,500,000	500,000	.....	.....	650,000,000	51,500,000	15	5 39
Colombia.....	1876	2,951,311	Aug. —, 1879	1,895,343	62,085	4,000,000	.....	4,500,000	64	1 53	5 54
Peru.....	1870	2,673,075	Mar. —, 1879	13,088,820	.....	1,819,933	.....	1,882,018	4 90	1 70	5 60
Brazil.....	1872	10,184,291	June 30, 1879	91,000,000	.....	.....	.....	11,000,000	14,980,838	6 01	6 15
Venezuela.....	1873	1,784,194	Mar. —, 1880	250,900	.....	.....	.....	11,000,000	91,000,000	14	1 63
Central America.....	1880	*2,600,000	June 30, 1880	163,347	2,318,381	373,919	.....	2,692,300	11,250,000	3 00	189 70
Argentina Republic.....	1880	*2,600,000	Mar. —, 1880	373,470,000	4,000,000	2,000,000	.....	6,000,000	379,470,000	3 00	189 70
Cuba.....	1877	1,394,516	Apr. 30, 1880	57,857,000	43,022,000	1,000,000	.....	44,022,000	101,870,000	31 60	73 10
Japan.....	1877	33,623,319	June 30, 1880	147,288,681	90,852,138	50,631,878	.....	150,514,016	297,862,687	4 47	8 55
Algeria.....	1874	2,867,626	June 30, 1880	8,578,000	8,685,000	5,790,000	.....	14,473,000	23,353,000	5 05	9 02
Haiti.....	1877	*572,000	June 30, 1880	.....	.....	.....	.....	5,000,000	5,000,000	8 74	.....
				4,031,721,853	2,819,303,004	2,060,697,480	422,252,541	5,448,842,853	9,470,564,706		

* Estimated.
 † Bank reserve only.
 ‡ Based on statement of director of the Calcutta mint for 1879, p. 43; report of depreciation of silver with coinage for ten years, from 1869 to 1879, added.
 § Economist, November 6, 1880, p. 1299.
 ¶ Dr. Soetbeer.
 g Report of the French Commission, p. 150.
 h M. Weth, president Swiss Confederation, "Gold and Silver" p. 193.
 i Report of the French Commission, p. 89.
 j London Economist, September 11, 1890, p. 1060.
 k Silver Commission, p. 510.
 l London Economist, Nov. 6, 1880, p. 1298.
 m Report for 1879.
 n Report of depreciation of silver with coinage for ten years, from 1869 to 1879, added.
 o London Economist, November 6, 1880, p. 1299.
 p Dr. Soetbeer.
 q Report of the French Commission, p. 150.
 r M. Weth, president Swiss Confederation, "Gold and Silver" p. 193.
 s Report of the French Commission, p. 89.
 t London Economist, September 11, 1890, p. 1060.
 u Silver Commission, p. 510.

COMMUNICATIONS FURNISHED FOR PUBLICATION IN
REGARD TO METALLURGICAL AND MECHANICAL PRO-
CESSES AND METHODS OF MINING EMPLOYED IN TREAT-
MENT AND PRODUCTION OF THE PRECIOUS METALS.

THE PRODUCTION OF THE PRECIOUS METALS IN CALIFORNIA, AND IM-
PROVED MACHINERY FOR MINING AND MILLING.

BY WALTER A. SKIDMORE.

The total product of the precious metals in California, from the date of the discovery of gold by James E. Marshall, January 19, 1848, at Coloma, on the American River, up to the close of the year 1880, has been estimated by statisticians at sums varying from one billion one hundred millions to one billion two hundred millions dollars; but perhaps the closest approximation has been made by Mr. Alexander Delmar, formerly Director of the Department of Statistics of the United States, who estimates the product up to the close of 1880 at \$1,135,000,000. Of this amount from three-fourths to four-fifths have been credited to placer mining (embracing all kinds of mining whereby auriferous gravel and dirt are washed), and from one-fourth to one-fifth to vein mining, or the extraction of the precious metals from veins of auriferous quartz by the stamp-mill method.

In the early history of mining operations of the State, the product was wholly from the placer mines, derived from shallow placers and river mining. From 1848 to 1850, inclusive, the gold product of California, derived exclusively from this source, was estimated by J. Arthur Phillips (an English mining engineer, who visited California in 1866, and made a special investigation of the production of the precious metals), to be \$100,000,000.

Subsequently to 1850 a large proportion of the gold product was derived from the deep placers, or ancient river channels, and from the crushing of gold-bearing quartz.

The following table will show the estimated production from the discovery of gold to the close of the calendar year 1880:

Period.	Amount.	Authority.
1848 to 1850, inclusive.....	\$100,000,000	J. Arthur Phillips, M. E.
1851 to 1860, inclusive.....	550,000,000	Do.
1861.....	40,000,000	Do.
1862.....	34,700,000	Do.
1863.....	30,000,000	Do.
1864.....	26,600,000	Do.
1865.....	23,500,000	Do.
1866.....	26,500,000	Do.
1867.....	25,000,000	J. Ross Brown, United States mining com- missioner.
1868.....	23,000,000	R. W. Raymond, commissioner.
1869.....	22,500,000	Do.
1870.....	25,000,000	Do.
1871.....	20,000,000	Alexander Delmar, Director Bureau Statistics, United States.
1872.....	19,000,000	Do.
1873.....	18,000,000	Do.
1874.....	20,300,000	Do.
1875.....	17,610,000	Do.
1876.....	18,610,000	Do.
1877.....	15,000,000	Do.
1878.....	17,000,000	Do.
1879.....	17,150,000	Do.
1880, estimated.....	17,500,000	Do.

The amounts foot up \$1,111,970,000, which is \$23,030,000 less than the aggregate estimate of Mr. Delmar; but the difference may be allowed for unreported bullion, and the estimate of \$1,135,000,000 accepted as approximately correct.

The returns from 1848 to 1850 are estimated on the basis of shipments by steamers from the port of San Francisco, but subsequently more accurate returns were obtained from the local common carriers (Wells, Fargo & Co. and Adams & Co.'s Express), and the production for the last three decades is relied upon as approximately correct. The largest annual production since 1850 is credited to the year 1853, when \$65,000,000 was returned; the smallest, for 1877, which shows only \$15,000,000. The average production of thirty years, 1851 to 1880, shows as follows:

First decade, 1851 to 1860.....	\$55,000,000
Second decade, 1861 to 1870.....	28,000,000
Third decade, 1871 to 1880.....	18,000,000

In reviewing the general condition of mining in this State we may reasonably estimate the average production of the next decade, 1881 to 1890, at \$15,000,000 per annum.

Quartz mining as a business was not known until 1852, and may be said not to have achieved the dignity of a science until as late as 1862, since which time there has been a steady increase in the ratio of production from this source, which compensates for the diminution from the early placers, and the slow but steady decrease from the hydraulic washings; hence it may reasonably be expected that in the next decade the ratio of production from quartz will steadily increase until it shall stand as one to two in the proportion of production; or, in other words, that from 30 to 33 per cent. of the gold product of the State for the next ten years will be from quartz.

The following table exhibits the condition of the mining industry at the close of the year 1880; but as the returns of the various departments are incomplete—notably the returns on quartz mining and ditches—the columns have not been footed up:

Tabular statement showing condition of mining in California, for the fiscal year ending June 30, 1880.

[Compiled from Mint Bureau Returns, United States Census, and State Reports.]

Counties.	Number of quartz mills.	Number of mining ditches.	Miles of mining ditches.	White population in mining counties.	Chinese population in mining counties.	Gold bullion produced.	Silver bullion produced.	Total production.	Remarks.
Alpine.....	3	7	300	589	17	17,113	24,146	41,259	Silver and gold bearing veins.
Amador.....	12	7	300	10,271	1,115	1,496,053	1,953	1,497,006	Principally from quartz on Mother Lode; 375 stamps running.
Butte.....	8	.....	390	14,937	(*)	430,501	1,247	431,748	Principally from deep placers by hydraulic; mining and agricultural county.
Calaveras.....	47	26	525	8,057	1,037	320,865	643	321,508	Production divided between quartz and shallow placers.
Colusa.....	.....	.....	.....	.....	.....	4,880	78	4,958	Shallow placers; agricultural county.
Del Norte.....	22	22	87	.....	.....	215,403	300	215,703	Beach sands and shallow placers.
El Dorado.....	26	5	500	9,197	1,433	389,383	208	389,591	One-third from quartz; balance from drift claims and hydraulic.
Fresno.....	1	.....	.....	.....	.....	143,433	.....	143,433	From quartz by arrastras; agricultural county.
Humboldt.....	5	1	6	2,923	90	153,940	80	154,020	Beach sands and shallow placers; agricultural county.
Inyo.....	4	.....	.....	.....	.....	48,648	173,916	222,564	Silver bearing veins and argentiferous lead ores; principally extracted by smelting.
Kern.....	2	3	7	.....	.....	94,214	390	94,604	Gold bearing quartz veins; agricultural county.
Lassen.....	4	.....	.....	.....	.....	25,900	.....	25,900	Gold bearing veins at Hayden Hill; agricultural and grazing county.
Los Angeles.....	4	4	21	7,700	.....	7,700	66,300	74,000	Shallow placers; agricultural county.
Mendocino.....	.....	.....	.....	733	.....	.....	125	733	Black sands; lumber and agricultural county.
Modoc.....	.....	.....	.....	10,000	.....	10,000	.....	10,000	Supposed to be from adjoining counties; grazing and agriculture.
Mono.....	10	5	40	7,140	.....	2,407,236	582,905	2,990,141	Gold and silver veins at Bodie.
Mariposa.....	27	.....	107	3,642	637	150,017	1,200	151,217	Principally from quartz mining.
Merced.....	.....	.....	.....	.....	.....	17,515	.....	17,515	From quartz by arrastras; agricultural and grazing county.
Nevada.....	17	217	824	16,820	(*)	2,702,362	70,144	2,772,506	About two-thirds by hydraulic; balance quartz.
Placer.....	10	22	388	12,030	2,106	2,835,433	640	2,836,073	About four-fifths from hydraulic and drift claims; balance quartz.
Plumas.....	15	34	700	5,312	(*)	827,154	181	827,335	About one-half quartz; balance hydraulic.
Shasta.....	4	28	630	8,156	1,336	140,455	117,907	258,362	Principally hydraulic mining.
Stanislaus.....	.....	1	15	.....	.....	73,271	.....	73,271	Principally from shallow placers; agricultural county.
San Diego.....	2	.....	.....	.....	.....	81,558	.....	81,558	Shallow placers and gold-bearing quartz; agricultural and grazing county.
Sacramento.....	.....	2	200	.....	.....	342,514	.....	342,514	From shallow placers; agricultural county.
Siskiyou.....	5	6	250	7,049	1,561	434,612	251	434,863	Three-fifths from shallow placers; balance quartz.
Sierra.....	22	55	366	5,873	1,250	974,392	576	974,968	One-third low grade quartz; balance drift claims.

Tabular statement showing condition of mining in California for the fiscal year ending June 30, 1880—Continued.

Counties.	Number of quartz mills.	Number of mining ditches.	Miles of mining ditches.	White population in mining counties.	Chinese population in mining counties.	Gold bullion produced.	Silver bullion produced.	Total production.	Remarks.
Tehama.....	29	14	190	7,043	805	1,500	.....	1,500	Shallow placers; agricultural and grazing county.
Tuolumne.....	3	1	400	3,052	(*)	461,861	1,071	462,432	About one-half from quartz; balance from placers.
Tulare.....	.....	.....	.....	.....	.....	1,125	526	1,651	About two-thirds from vein mining; agricultural county.
Trinity.....	.....	25	400	.....	.....	326,693	142	326,835	Principally river and shallow placers; quartz by arastras.
Ventura.....	.....	.....	.....	.....	.....	326,693	.....	326,693	Quartz by arastras; Grazing county.
Yuba.....	1	6	100	9,121	(*)	937,360	438	937,798	Gold from hydraulic mines; county has large agricultural interests.

* No returns.

By reference to the foregoing table, it will be observed that about one-fifteenth of the total bullion product of California is credited to silver. It should not be inferred from this that California is to any extent a silver-producing State, as the silver so reported by the San Francisco mint is derived from the natural alloy of the gold by separation of the bullion, and only in a few instances from the beneficiation of ores of silver at the mines. The latter metal only occurs in its ores in the counties of Inyo and Alpine, on the eastern slope of the Sierra Nevadas, in the former with argentiferous lead ores (galena and carbonates), and in the latter in base metal ores (antimony, arsenic, and lead) treated by mill process after roasting. On the western slope, Shasta County contains several mines of silver-bearing ores, showing nearly 46 per cent. of her production to be from this source. Alpine County returns 58½ per cent. of her total production from silver ores, and Inyo 78 per cent. Mono County, on the eastern slope, is credited with \$582,905 in silver. This production comes principally from Bodie district, where the precious metals are found in a natural alloy known as "electrum."

Prof. Henry G. Hanks, State mineralogist, in a paper on the occurrence of this alloy, read before the Microscopical Society of San Francisco, says:

The Bodie electrum is of a pale yellow color, resembling German silver; has a metallic luster; takes a high polish; is malleable and ductile; its hardness equals 3, being softer than our coins, either gold or silver; specific gravity, 15.15; contains, gold, 633.4; silver, 346.1; total fineness, 997.5.

This peculiar metal also exists at the Hayden Hill mines of Larsen County, on the eastern slope of the Sierras, where the geological formation is similar to that of Bodie. All of the gold of California is more or less argentiferous, showing an average fineness in silver of 120 to 880 of gold.

The sources of the gold product may be classified as follows:

1. Deep placer mining:
 - a. By hydraulic method.
 - b. By drifting method.
2. Vein mining:
 - a. By crushing of auriferous quartz.
 - b. By pocket mining.
3. River and bar mining.
4. Shallow placers.

The term shallow placers is used herein to distinguish the remnants of the early surface workings from the deep channels or "ancient rivers" of a former geological period, known as the "Pliocene," which are worked on such an extensive scale by the hydraulic and drift methods, and are now, as they will be for the next half century, the principal source of the gold product of California.

DEEP PLACER MINING.

Deep placer mining is conducted by two methods, known, respectively, as the "hydraulic" and the "drift." In the former the auriferous earth is washed by powerful streams of water projected under great pressure upon the faces of the bank, running the disintegrated gravel over long lines of sluices, in which the gold is caught through the agency of quicksilver. In the latter, only the lower or richest stratum, lying next the bed rock, is extracted, by tunnels and breasting, in a manner sim-

ilar to the working of horizontal veins of coal. The dirt is emptied into large boxes or vats, where it is washed by a stream of water under pressure, and passes through long lines of sluice-boxes, as in the case of hydraulic mining.

In the manner of extraction and saving of gold, both systems are a duplication of the primitive methods of mining on a larger scale.

No ground is worked by the drift method where hydraulicing is practicable, and no companies engaged in hydraulic mining have found it profitable to adopt the drifting method. The pay gravel in hydraulic mines is not limited to the bottom stratum; but, on the contrary, the superincumbent dirt, sometimes 300 feet in height, is more or less auriferous from bed rock to grass roots. The pay varies with the strata, but is occasionally cut off, sometimes by a stratum of pipe clay formed during some quiescent period of the ancient river system; that is, when the water ran in large volume with light grade, and carried in suspension the loose material of the banks of the stream—probably during seasons of high water—to be followed again by a gravel wash. Thus a vertical section of a hydraulic bank 200 to 300 feet in height would present alternate strata of gravel and pipe clay with hard cemented gravel on the bottom and loam on the top. The bottom stratum is generally the richest, and the profit of working the upper strata by the hydraulic method depends upon the quantity of water available, the grade or fall, and the outlet for the tailings, &c.

The investigations of the State geological survey, and of the agent of the United States mining commissioner, have thrown much light upon the value of this material per cubic yard, and the facts are published in the various reports of the United States mining commissioner. Thus it appears that in Gold Run district, Placer County, the return from the upper strata to a depth of about 200 feet was only about 6 cents per cubic yard up to 1874, and yet hydraulic mining had been profitably pursued. The average yield of the section embraced by the Yuba River drainage was somewhat greater. In some instances the yield was less than 5 cents per cubic yard. But this valuation did not include the bottom stratum, which had not been reached at the period of the publication of those reports.

THE HYDRAULIC METHOD.

Hydraulic mining, as prosecuted in California at the present day, has been graphically described by Mr. James D. Hague, in an elaborate report on the property of the Eureka Lake and Yuba Canal, as follows:

The material deposited in these ancient channels is mainly composed of rounded and water-worn masses of quartz, slate, granite, and, indeed, all the rocks of the Sierra, varying in size from huge boulders of many tons' weight to small pebbles and fine sand, accompanied in places by occasional beds of a very tenacious clay. Fossil wood is of frequent occurrence. The higher portions of the deposit, commonly called "top gravel," form a not very compact mass, sometimes white, but generally of a yellowish or reddish-brown color, due to the oxidation of iron. The lower portions, in which the oxidation of the iron has been complete, have a blue or green tint. The bottom gravel is generally a very compact and firmly-cemented conglomerate, often requiring the use of much powder for its disintegration. The blue gravel of the bottom varies from a few feet to over 100 feet in depth; the top gravel, from 50 to several hundred feet, according to the height of the surface ground above the bed-rock. As these gravel deposits have proceeded from the disintegration of gold-bearing rocks, the entire mass is more or less auriferous. The gold, however, is not evenly distributed. The top gravel, though perhaps more uniform in value, is comparatively poor, while the richest is generally within a few feet of the bed-rock, often occurring in pay streaks, which, though they follow in a general way the bed of the channel,

change their course capriciously, as the currents depositing them turned one way or another. In some cases, where this bottom dirt is exceptionally rich, and especially where the gravel is covered by lava so deeply that hydraulic mining is impracticable, the process of drift mining is employed, tunnels being driven in on the bed-rock, and the rich dirt so mined out without disturbing the top; but since in hydraulic mining it is impossible to reach and work the bottom gravel without first removing the top, the entire deposit, when worked by this method, must be subjected to the process of mining and washing.

The hydraulic method consists in the application of water in very large quantity, and under high pressure, to the work of removing and disintegrating the material of these gravel banks, and washing it through long sluices and other contrivances, in which the gold is saved by amalgamation with quicksilver. The water supplied by the ditches at a high elevation is conducted in iron pipes to the scene of operation in the diggings, where it is discharged through a nozzle of several inches in diameter and under a pressure of several hundred feet, issuing in a stream with great velocity and power, and directed against the face of the bank which is to be washed.

At the present day the diameter of the nozzles vary from 5 to 8 inches; the pressure under which they are used at various places from 150 to 400 feet; the velocity with which the water is discharged may vary from 75 to 150 feet per second, according to the pressure, and the quantity of water thus discharged through one nozzle according to all these varying conditions ranges from 300 or 400 to 1,200 or even 1,500 inches. A discharge of 1,000 inches in a single stream is not unusual. The volume of water thus discharged is 1,570 cubic feet per minute, weighing but little less than 100,000 pounds.

It is obvious that one of the most essential conditions in this method of mining is that of a suitable outlet from the "diggings" for the discharge of the body of water thus employed and for the disposal of the material moved by it, and especially of a sufficient grade for the proper establishment of sluice-boxes and other gold-saving appliances through which the stream must pass, carrying along with it the mass of auriferous *debris*. The sluices for this purpose are always many hundred, and frequently many thousands of feet in length. Their grade must be sufficient to give the water the velocity necessary to carry the mass of gravel through them. The grades employed vary usually from 6 inches in 14 feet, or $3\frac{3}{4}$ per cent., to $10\frac{1}{4}$ inches in 12 feet, or $7\frac{1}{4}$ per cent., and even more. The former is considered a very light grade, but lighter ones are sometimes employed where the conditions of the surface leave no room for choice. To meet this required condition of outlet and fall, a tunnel must usually be driven in through the bed-rock till it is beneath the body of gravel to be attacked, starting from some conveniently located ravine at a point low enough to afford the desired grade in the distance necessary to reach the most remote part of the deposit. The sluice-boxes being laid in the tunnel, the stream of water carrying with it the *debris* of the bank, passes through it, and so beyond the outlet where the material is finally discharged into the river below.

The method known as drifting is the result of necessity and not of choice. The drifting claims are uniformly situated in the higher ranges of the Sierra Nevadas, and are covered with hundreds of feet of superincumbent matter, consisting of volcanic mud and scoria; in some instances, as at Bald Mountain, Sierra County, capped with a table of basalt of a thickness of 100 feet or more. Therefore the process known as drifting is the only one available for the extraction of the gold, and being necessarily expensive (the cost varying from \$1 to \$2 per cubic yard), only the lower stratum on the bed-rock can be profitably worked.

A vertical section of a drifting claim would in no respect differ from that of a hydraulic bank above described, except that the volcanic matter covers the auriferous gravel to great depth. Hence the necessity of extracting the dirt by tunnels and galleries.

The principal factor in the operation of hydraulic mining is the ownership or control of an abundant supply of water at all seasons from a source of sufficient altitude to cover large areas of mining ground, and a market for the sale of surplus water not required for washing the company's ground.

In this connection it may be pertinent to present a statement of the length and capacity of ditches constructed for like purposes in California.

Statistics of mining ditches in California.

Name.	Length.	Capacity.	Grade.	Cost.	Dimensions in feet.		
					Top.	Bottom.	Depth.
North Bloomfield, including reservoirs.....	<i>Miles.</i> 157	<i>Inches.</i> 3,200	<i>Feet per mile.</i> 12 to 16	\$708,841	8½	5	3½
Milton, including reservoirs.....	80	3,000	12 to 25	391,579	6	4	3½
Eureka Lake and Yuba Ditches.....	163	5,800		723,342			
South Yuba Ditches.....	123	7,000	8 to 13		6		4 to 5
Smartsville Ditches.....		5,000	9	1,000,000	8	5	4
Spring Valley and Cherokee.....	52	2,000			5		3½
Hendricks.....	46½		6 to 12	136,150	5		2
La Grange.....	20	2,700	7 to 8	500,000	9	6	4
Blue Tent.....	32	1,800	10	150,000	8	6	4

The above embraces only the operations of great magnitude, combining the possession of large areas of hydraulic ground with the exclusive rights of water from great water-sheds.

The sale of water is one of the principal sources of the profit of the larger hydraulic companies. Their sales run from one to two millions 10-hour inches per year. The water is sold to mine owners on the line of the ditches at prices varying from 10 to 15 cents per inch of ten hours use. The cost of maintenance of the larger ditches is from 3 to 3½ cents per inch, not including interest on the capital invested. The expense is in repairs, watchmen, &c.

The value of the auriferous contents of "deep-placer" ground is estimated in various ways in California.

First. The average yield of cubic yards washed during a long term.

Second. The yield per miner's inch of water used in hydraulic operations.

Third. The yield per superficial yard or acre of the bed-rock stripped (in this case the height of bank is not uniform, and the method of valuation is only of local application, as in districts where the working benches have a nearly uniform height); and

Fourth. In drift mines the yield per car load, per cubic yard, or per linear foot of channel.

The following tabular statement of the average yield of auriferous gravel worked on a large scale by the hydraulic method has been compiled from the returns of companies who have acquired extensive and exclusive water rights and large areas of ground, embracing the principal enterprises included in the table on page —.

Name of company.	Average height of bank.	Yield per cubic yard.
	<i>Feet.</i>	<i>Cents.</i>
Smartsville claims, Yuba County.....	112	19½
Blue Tent, Nevada County.....	180	15
North Bloomfield, Nevada County.....	180 to 260	4 to 6½
Gold Run, Placer County.....	200	4½
Columbia Hill, Milton County.....	100	4½
La Grange, Stanislaus County.....	18 to 100	2½ to 15½
Patrickville, Stanislaus County.....	40 to 60	4½ to 18½
Dardanelles, Placer County.....	150	13

But the profits of hydraulic mining do not depend so much upon the contents per cubic yard as upon the facility and economy with which the auriferous material may be moved, cost of water, means of outlet, &c. It is within the personal knowledge of the writer that a claim near Iowa Hill, Placer County, yielded cost of outfit and a fair profit in the season of 1879, when the product was only 3 cents per cubic yard. In this case the owner possessed a water right and ditch.

With a view to the presentation of some statistics of the operations of hydraulic companies, with a record of production less than the average, I have selected the data of several claims in Stanislaus County, California. The figures are compiled from a paper on hydraulic mining in California, by Aug. J. Bowie, jr., M. E., which will be found in the Transactions of the American Institute of Mining Engineers for 1879. The period covers the operations of two seasons.

Name of claim.	Average height of bank.	Pressure of water.	Cubic yards washed.	Cubic yards of gravel moved per miner's inch.	Yield per miner's inch, water.	Yield per cubic yard.
	<i>Feet.</i>	<i>Feet.</i>			<i>Cents.</i>	<i>Cents.</i>
French Hill claim.....	30	50 to 70	676, 968	1.08	14	13
Light claim.....	45	60	683, 244	1.80	12	6 $\frac{1}{2}$
Chesnan claim.....	23	70	284, 932	1.37	23	16
Johnson.....	30	80	196, 632	1.76	8	4
Licard.....	90	90	155, 347	2.89	37	13
For a corresponding period the North Bloomfield, of Nevada County, showed the following results.....	180 to 260	.....	4, 104, 700	4.5	23	5 $\frac{1}{2}$

Name of claim.	Cost of water per cubic yard.	Cost of labor, material, &c., per cubic yard.	Total cost, per cubic yard.	Total expenses.	Total yield.
	<i>Cents.</i>	<i>Cents.</i>	<i>Cents.</i>		
French Hill claim.....	1.	5	6	\$42, 655 83	\$90, 186 19
Light claim.....	. 006	3	3 $\frac{3}{4}$	25, 962 82	45, 444 65
Chesnan claim.....	. 008	4	4 $\frac{1}{2}$	15, 923 71	47, 781 73
Johnson.....	. 006	3	3 $\frac{3}{4}$	7, 468 00	9, 148 27
Licard.....	. 004	3 $\frac{1}{2}$	3 $\frac{1}{2}$	6, 205 40	20 197 07
For a corresponding period the North Bloomfield, of Nevada County, showed the following results.....	. 0755	2 $\frac{1}{2}$	3	147, 912 58	267, 007 50

The examples above cited have been selected exclusively from the record of companies who have washed gravel of low grade by hydraulic method with a steady profit. The average yield per cubic yard on the above exhibit would be 7 $\frac{1}{2}$ cents. In the case of the claims in Stanislaus County, if we take 7 $\frac{1}{2}$ cents per cubic yard as the average yield, and 45 feet as the height of bank, each acre of gravel washed would yield \$5,263.50. In Weaver Basin, Trinity County, the yield has been from \$8,000 to \$12,000 per acre where the height of the bank has varied from 30 to 50 feet. These examples are quoted for the purpose of showing the minimum rates of profitable operations where the depth of the gravel is less than 100 feet.

The average of the deep washings on the ancient channel claims where the banks are more than 100 feet in height would be a little over

10 cents per cubic yard, if we make the estimate from the basis of the returns of the past five years.

At the North Bloomfield mine, Nevada County, the yield has not averaged 10 cents per cubic yard. The yield of this company per miner's inch of twenty-four hours for the past ten years has varied from 13½ to 27½ cents; but this has been from top dirt, the bed-rock bench not being reached.

But we should not assume from the foregoing statement of the operations of companies hydraulicizing low-grade dirt that the richer ground of the deep placers is exhausted.

A recent examination of the yield of the Paragon claim, Placer County, California, by F. Von Leight, M. E., shows the following results for six seasons (from 1874 to 1879) by the hydraulic method only:

Total production for period	\$243,075 87
Dividends paid	119,670 14
Average yield per miner's inch, calculated on a basis of 24 hours' inch under 6-inch pressure	2 54

In this case the lower stratum was washed and the bed-rock stripped. The highest yield per inch was in the season of 1874-'75, when \$4.04 per inch was realized; the lowest was in the season 1878-'79, when 86½ cents per inch was realized. The largest yield of any season was that of 1875-'76, \$90.04, or \$3.43 per inch. The company are also engaged in drifting, but the yield and value of ground from that source will be noticed under the head of drift mining.

The system of valuation of ground per cubic yard has long been in disuse in California, by reason of the disparity of conditions of a hydraulic bank, both in respect to its material (whether composed largely of pipe-clay or gravel) and its depth. Thus, several successive hydraulic benches in deep places may yield, from grass roots to a depth of 100 feet or more, from 5 cents to 20 cents per cubic yard, while the lower or bed-rock stratum will yield from \$2 to \$6 per cubic yard. In many cases surveys are not made, and the returns are the results of "guessing." The highest returns of the past season by the hydraulic method, where measurement was made, is stated, on the authority of Mr. James Arnott of Brandy City, Sierra County, to be \$1.50 per cubic yard. In this case the bank was 24 feet in height, and the yield included the lower stratum and the bed-rock. The product per miner's inch has come to be accepted as the standard of value of hydraulic ground.

A miner's inch is the quantity of water which flows from an area of 1 inch square with a pressure of water of 6 inches, measured from the top of the aperture of delivery. It has been ascertained by experiment that the quantity of water flowing under such conditions for a period of twenty-four hours would be 2,230 cubic feet. The standard of pressure varies slightly in different localities, from 4 to 6 inches, but the average has been stated by Mr. James D. Hague to equal 1.5625 cubic feet per minute, 93.75 cubic feet per hour, and 2,250 cubic feet per twenty-four hours. The velocity of 1 inch of water under such conditions (6-inch pressure) would be 3 feet 9 inches per second, at the delivery gauge of the water-box. The water so delivered gains its effective force in proportion to the "head" or vertical distance between the delivery-box and the point of discharge, or nozzle of the miner's pipe.

The amount of gravel moved would vary according to the hardness of the ground and the force or pressure with which the water was projected against the bank. In the larger hydraulic operations, such as the Bloomfield, Spring Valley, Excelsior, &c., the water is projected against the face of the bank with a "head" or pressure of from 150 to 300 feet,

through nozzles of 6 or 8 inches in diameter. Such a stream will carry from 600 to 800 inches of water, miner's measurement, and each 24-hours' inch, on an ordinary grade, will wash from 5 to 7 cubic yards of gravel, weighing about 1.8 tons per yard. At North Bloomfield it has been calculated that 19 cubic feet of water is required to move 1 cubic foot of solid gravel in a bank.

During the year 1879, R. H. Stretch, M. E., made a special examination of the hydraulic mines of the Forest Hill divide, Placer County, California, and has tabulated the results as follows:

Mines.	Inches of water.	Pressure in feet.	Yards moved per inch.	Yield per yard in cents.	Yield per inch in cents.
Hobson	42, 789	360	20. 60	3. 50	70
Pritchard	51, 015	100	2. 73	10. 71	26. 48
Morning Star	139, 759	200	5. 61	8. 87	37. 24
Orion	42, 000	450	10. 19	2. 48	50. 00
Enterprise	46, 362	275	5. 61	8. 78	49. 24

In closing this branch of the subject of deep placer mining we present the following table compiled from various sources embodying the result of the investigation of mining engineers during the past ten years.

Table showing the yield of gravel per cubic yard of hydraulic mines in California.

Name of claim.	Location.	Yield per cubic yard.	Authority.
American Company	Sebastopol, Nevada County	\$0 24	Hamilton Smith, jr.
Blue Tent	Nevada County	15	R. W. Raymond.
Blue Point (1870)	Smartsville, Yuba County	1 23	Hamilton Smith, jr.
Gold Run (1870)	Placer County	04. 8	William H. Pette.
Dardanelles & Oro	Forest Hill, Placer County	13. 1	Joseph McGillivray.
McCarty's Diggins	Columbia Hill, Nevada County	43. 3	J. D. Hague.
Smartsville Mine	Sucker Flat, Yuba County	19. 5	Amos Boman.
Union Gravel Mine	Empire Hill	15	Do.
Pactolus Gravel Mine	Yuba County	20. 8	Do.
Blue Gravel Mine .....	.....do	63	Do.
Pittsburgh .....	.....do	41	Do.
Pactolus .....	.....do	44	William Ashburner and J. D. Hague.
North Bloomfield .....	.....do	12. 0 to 16. 3	Hamilton Smith, jr.
Spring Valley	Cherokee, Butte County	28	R. H. Stretch.
French Corral	Nevada County	33. 4 to 47. 4	Hamilton Smith, jr.
Manzanita .....	.....do	27. 4 to 33. 3	Do.

The above table extends over a period of ten years' operations, but the yield is not averaged, as it has varied from year to year.

DRIFT MINING.

About one-third of the gold yield credited to deep placer mining is produced by the method known as "drifting," or extracting and working only the lower stratum of the ancient channels. This system is prosecuted to some extent throughout the gold-bearing region of central California, but only on a large scale in Placer County and Sierra

County, where the channels are covered to great depths with volcanic outflow. The gravel extracted is either washed by a hydraulic stream through long lines of sluices, or crushed in a stamp-mill in the same manner that quartz is treated. The result of the operations of representative mines working by this method are herewith presented.

At the Paragon mine of Placer County a 10-stamp mill, of a capacity of 40 tons per day, was erected, and commenced crushing September 19, 1879. The record of a continuous run to April 14, 1880, gave the following results:

Car loads of gravel crushed.....	4,241
Total yield.....	\$44,835 53
Average yield per car load.....	\$10 57
Average cost per car load, mining and milling.....	\$3 94

A car load contains on an average 28 cubic feet, weighing about $1\frac{1}{2}$ tons, and the yield per ton was therefore \$7.05. The mill has 10 stamps, averaging 850 pounds to the stamp, with steel shoes and dies, making 80 drops of 10 inches per minute. The gravel is dumped from the track of the bed-rock tunnel to the mill platform where the larger rocks are picked out and conveyed to a waste pile, which is occasionally sluiced and yields some gold. The remainder or softer material is fed by hand to the mortars which have a single discharge through screens with round holes of $\frac{3}{16}$ inch diameter. The resulting pulp flows over a table 8 feet long provided with grooves or riffles charged with quicksilver. Thence the pulp passes through "rubbers" into a concentrator where a small proportion of the gold is saved. The mill is run by steam-power, and consumes three cords of wood per twenty-four hours. The working bed-rock tunnel of this mine has now attained a length of nearly 1,900 feet, from which upraises are made to the gravel as the tunnel progresses.

The force of men employed at the mine consists of:

	Per day.
Two engineers.....	\$7 50
Two feeders.....	7 00
Three helpers.....	6 00
Foreman.....	4 00
Blacksmith.....	3 50
Thirty-one miners and carmen.....	93 00
Total.....	121 00

The Hidden Treasure Company, situated on the Forest Hill Divide in Placer County, owns 10,560 feet of channel, of which 872 feet had been worked out on May 1, 1880, yielding an aggregate of \$274,283, or \$294 per lineal foot of channel. The gravel is extracted by a working tunnel 2,400 feet in length and washed in sluices. The yield prior to 1878 was \$50,719.89, but no accurate record of expenses was kept.

From 1878 to May, 1880, the books show the following results:

1878—gross yield.....	\$61,205 92
1879—gross yield.....	93,437 15
1880—gross yield to May 1.....	36,920 10
	<hr/> 196,563 17
1878—labor.....	\$32,891 25
other expenses.....	8,345 92
	<hr/> \$41,237 17, or 67 $\frac{3}{10}$ per cent. of product.
1879—labor.....	37,550 34
other expenses.....	7,867 60
	<hr/> 45,417 94, or 46 per cent. of product.
1880—(to May 1) labor.....	14,394 45
other expenses.....	1,664 38
	<hr/> 16,058 83, or 43 per cent. of product.
Total expenses.....	102,713 94, or 52 $\frac{1}{2}$ per cent. of product.

The corresponding profits were, 1878, \$19,968.75, or 32.7 per cent of product; 1879, \$53,039.21, or 54 per cent. of product; 1880 (to May 1), \$20,861.27, or 66.5 per cent. of product. Therefore the result of twenty-eight months of continuous working may be summed up as follows:

Total product.....	\$196,563 17
Expenses	102,713 94
Profit about 47½ per cent	93,849 23

Mr. F. Van Leight, M. E., has recently made an examination of the country known as the "Forest Hill Divide," whereon the above-described mines are situated, and in his report describes the theory of the gold deposits, which may appropriately be quoted as pertinent to the origin of channels of like nature, now extensively worked throughout the State:

The whole country from the junction of the two forks of the American River to within a few miles of the main ridge of the Sierra Nevada has proven to be auriferous, and gold has been found in almost every place in smaller or larger quantities, especially in the gulches and ravines. In following these indications, and by mining deeper into the hillside, it has been ascertained that a deep channel or river-bed, now covered by mountains, has run, in ages past, through the country, with its general course almost parallel to and below the center line of the present mountain ridge, its bed filled with the detritus of different rocks, rounded and smoothed, as we see them in the river beds of to-day.

At what period of the existence of our globe these rivers flowed, and when the revolution took place which made such changes, will, of course, ever be a mystery, but that these rivers existed, and that the same forces of gravitation and attrition worked then as they do now, and incessantly will, is a fact beyond doubt.

The miner has assisted the geologist in bringing these facts to light; the geologist has assisted the miner in connecting the links of the broken chain and pointing out the probable course of this ancient river; and following, step by step, we know now how these rivers have flowed and filled their beds with stones, gravel, and sand. We know also that a great volcanic outflow took place, which, running into the beds of these ancient rivers, covered them with lava and filled the cañons up to a level with the country's surface, and forced the water to sweep out new channels. So it happened that the lava was often covered again with the gravel, till finally the water found a fissure, which it enlarged and deepened, and which forms to-day the bed of our rivers, while the rivers of the past are under mountain ridges, and often 1,000 to 2,000 feet and more above the bed of the present streams.

The same system of mining is prosecuted on a large scale in Sierra County, on the "Blue Lead," an ancient river of the Niocene age which is supposed to have its sources in the high mountains of Plumas and Lassen Counties, whence it pursued a general southerly course through Sierra and Nevada Counties, where it is extensively worked by both the hydraulic and drift methods. The channel has a width of from 200 to 500 feet.

In Sierra County the pay-gold is quite coarse, and is confined to a stratum from 2 to 4 feet deep on the bed-rock. It is covered by deep deposits of low-grade gravel, pipe-clay, and volcanic matter.

The "Blue Lead," as it is termed in these counties, has a grade on its downward or southerly course of from 50 to 170 feet per mile. It has been cut through at right angles by the various branches of the Yuba River, and the gold released was deposited in the beds of the modern streams, and to this source is due nearly all the gold taken from the Yuba River and its tributaries. This ancient channel was opened at many places as early as 1853, and has been continuously worked since that time. The net returns from the early workings, comprising a distance of several miles in the aggregate, upon the course of the channel, have been estimated to be from \$200 to \$300 per linear foot, as nearly as may be determined from the imperfect records of early operations. As this channel is above the present drainage, the method of

working has been by tunnel, driven, when practicable, from the lower end of the claims.

The location, elevation, and course of the channel having been ascertained by shafts or surface indications, a tunnel is driven from the nearest practicable point toward the lower or down-stream end of the ground. This tunnel, after reaching the channel, is continued up stream as nearly as possible in the center of the channel, keeping partly in bed-rock and partly in gravel. From this main tramway lateral drifts are driven at regular intervals, say of 60 feet on either side, and the gravel between the lateral drifts is excavated by the miners, and shoveled into the cars that are run into the side drifts. The gravel over head is supported by timbering until the pay-gravel for a considerable area is removed, when finally its great weight settles it down to the bed-rock, or the swelling of the bed-rock causes it to close. As this settling would crush the timbers of the main tunnel, if all the pay-gravel was removed along its course, pillars of ground are left for 30 feet or more in width on either side of the main tunnel.

When the limit of the claim has been reached these pillars are extracted as the workmen are moved back toward the mouth of the tunnel before the mine is abandoned. The rapidity with which a mine can be worked depends largely upon the speed with which the main tunnel can be driven ahead. The amount of gravel extracted depends upon the width of the channel, as the thickness found profitable to extract by this method is rarely more than 3 feet.

The Bald Mountain mine of Sierra County, which has been worked in a systematic manner since 1872, may be considered as a representative mine of the drifting class. The company owns 7,500 linear feet of the channel, of which about 4,000 feet had been worked up to the close of 1880. Up to August 1, 1880, there had been worked 3,850 feet of channel, yielding \$1,788,000, or at the rate of \$464 per linear foot, at an expense of \$240 per foot. The yield was on an average \$2.17 per car load, or \$1.76 per ton.

The original outlay on shaft and tunnel was.....	\$20,000
Purchase of tailings, outlet, and disputed title.....	31,000
Working expenses to August, 1880.....	923,000
Total outlay.....	974,000

The operations of the company have been tabulated from its records as follows:

Year commences July 1.	Car loads.	Gross yields.	Per car load.	Dividends.
1872 to 1875.....	195,940	\$544,000 00	\$2 77	\$284,000 00
1875 to 1876.....	100,080	296,841 76	2 96	150,000 00
1876 to 1877.....	98,044	235,803 57	2 40	70,000 00
1877 to 1878.....	106,160	269,755 00	2 54	120,000 00
1878 to 1879.....	90,274	164,909 00	1 82	40,000 00
1879 to 1880.....	86,378	188,892 40	2 18	60,000 00
1879.				
Oregon Creek.....		3,000 00		
July 1, 1880.....	676,876	1,702,701 73	*2 17	724,000 00
To August 1, 1880.....		16,914 38		20,000 00
		1,728,616 11		744,000 00

* General average.

The record of yield per foot of channel of this class of mines has formed the subject of investigations of mining engineers for the last

few years, as the opinion prevails that the future product of gold in California for the next twenty years will depend largely on this source of supply.

Mr. E. S. Thurston, for several years a mining superintendent in Sierra County, has taken pains to compile the product and rate per foot of channel of the leading mines of the last ten years, with the following results:

Mine.	Length of location.	Yield per foot.	Total yield.
Union	2, 400	\$625 00	\$1, 500, 000
Hawkeye.....	800	437 50	350, 000
Pittsburgh.....	860	506 00	420, 000
Monumental.....	1, 040	312 00	325, 000
Empire.....	1, 560	482 05	752, 000

The working life of a mine of this class has a duration of from ten to twenty years, according to the length of its location on the channel. When the ground is exhausted the next company in line takes the ground, either by opening through a new tunnel, where feasible, or acquiring the right of way from the company who have worked out their ground. The number of men employed varies with the water season—the full complement being from 80 to 100 miners. The undeveloped ancient river channels underlying the volcanic capping of the western slope of the Sierra Nevadas will afford a sure and steady supply of gold for the next twenty years by the drift method.

ALLUVIAL PLACERS.

The shallow placers and the modern rivers and bars furnished nearly all the gold produced from 1848 to 1852. With the discovery of the ancient channels, which proved to be the original sources of the gold accumulation in the above class of diggings, the primitive method of mining has been gradually abandoned for the more gigantic operations now in vogue. Bed-rock tunnels, thousands of feet in length, were run to tap the bottoms of the ancient rivers; mountain lakes and valleys were utilized as reservoirs by means of the construction of dams at the outlet of the lakes, and canals, conducting many thousands of inches of water, even in the dry seasons, were carried down the backbones of the lateral ridges of the Sierra Nevadas, commanding vast areas of mining ground and terminating in the agricultural and vine lands of the foothills of the Sacramento and San Joaquin Valleys, and hydraulic mining gradually assumed its present magnitude.

The shallow placers were for a time ignored or abandoned, not by reason of their exhaustion, but on account of the expense of bringing upon them water, and the greater difficulty of finding grade or outlet for the tailings, which has finally been obviated by a mechanical invention, which was as much the result of necessity as was the gradual development of the "monitors" and heavy pipes now in use, superseding the canvas pipes and small nozzles of the early miners. By means of this invention, known as the "Cranston Hydraulic Elevator," this class of ground has again attracted attention, and large areas, abandoned for many years, are now being worked with profit. The ground termed shallow placers consists of auriferous gravel, which has been disintegrated from its primitive beds in the ancient channels by the cutting through of rivers and water-courses and redeposited on

low lands, sometimes filling basin-shaped depressions or shallow ponds and lakes, where the grade and water-flow was only sufficient to spread them over large areas, as heavy sediment, in the same manner that tailings from the hydraulic mines are now encroaching upon the valleys. It is true that this form of deposit is found at high altitudes in the mountains, as in Calaveras, Tuolumne, Butte, and other counties at elevations of 2,500 to 2,800 feet above the sea-level, but in such instances they occur below the plane of some ancient river channel which has been broken by the streams of the present period, and the gravel swept by great torrents of water to some depression on the line of the flow, where it lodged and formed the present so-called "flats." In this manner the breakage of the Table Mountain channel of Tuolumne County has created extensive areas of auriferous gravel on both sides of the basalt-capped river, which was once the principal drainage of Central California. The depth of these deposits varies from 20 to 80 feet, but owing to the want of grade long tunnels are required to bottom them and drain the water, and many thousands of acres of this class of gravel remain unworked awaiting the consolidation of claims and the necessary capital to run tunnels. The greatest areas are, however, found on the foothill benches of the Sierra Nevadas, and occasionally on the edges of the San Joaquin and Sacramento Valleys at an elevation of from 200 to 300 feet above sea-level.

Below Oroville, Butte County, near the banks of the Feather River, there exist many hundred acres of this shallow gravel deposit, which probably had its source from the Table Mountain of Butte County. This ground is worked principally by Chinese, who have been known to pay as high as \$5,000 per acre for the fee simple. Their method is primitive, consisting of sinking pits to the bed-rock and washing the gravel in sluice-boxes. The water is extracted by hand labor by means of the Chinese pump—a series of buckets attached to an endless belt. The pits are rarely more than 10 or 12 feet deep, and the profitable gravel lays on the bottom. Higher up in the foothills, at Bangor and Wyandotte, these deposits are worked by companies using the Cranstons elevator. At Ohio Flat and New York Flat, on the borders of Butte and Yuba Counties, at an elevation of about 2,000 feet above sea-level, the gravel formation has a thickness of from 12 to 20 feet on a granite bed-rock, and seems to have resulted from the covering of a shallow water-course which often expanded into ponds and lakes. The yield of ground here has varied from \$12,000 to \$30,000 per acre.

In the Sacramento Valley, near Pino, a station on the line of the Central Pacific Railroad, there are many hundred acres of auriferous gravel of a depth of 3 to 5 feet deposited upon flat lands. These claims are successfully worked by the hydraulic elevators. The method consists of driving the gravel by means of a strong head of water up an inclined plane to the head of a sluice, usually equal to from 10 to 20 feet vertical. This is accomplished through an inclosed flume having an inclination upward of 45°, and a length proportionate to the head of water used. At the base of the inclined flume there is a ground section, set as near the bed-rock as possible, into which a hydraulic nozzle is introduced, delivering a head of water under a pressure of 100 feet or more, which drives the gravel before it up the inclined flume to the boxes or sluices. The gravel and water enter from an open box back of the hydraulic nozzle. In order to run gravel two streams are required, one delivering its head upon the gravel bank, whence the gravel is driven by ground sluice to the machine, and the other discharging inside the ground section at the base of the inclined flume.

The hydraulic elevator runs water and gravel upward to a sluice grade, works mines that have no dump, saves bed-rock tunnels, opens cuts, and drains mines of all surplus water coming through the gravel or on the bed-rock. It can be made of any capacity, the same as a flume, and will handle any head of water used in hydraulic mining. Wherever hydraulic pressure can be had, say 100, 200, or 300 feet, a mine can be worked to advantage from 10 to 35 feet deep. The machines will lift 10 feet high to every 100 feet of pressure used to drive them; high pressure works better than low pressure. When 200 feet of pressure can be obtained to lift 10 feet high it does not take quite half as much water to drive the machine as to lift 10 feet high with 100 feet of pressure; that is 200 feet of pressure will lift 20 feet high better than 100 feet of pressure will lift 10 feet high. The machines require about one-third to one-half of the water to drive them, leaving half to two-thirds of the water to be used in the mine through the giants.

It will be evident from the above description that if there is sufficient force exerted by the water discharged from the nozzle of the machine to drive it, that earth, sand, gravel, and rocks entering the machine must necessarily be carried along and be discharged with the water into the flume on top. The water, gravel, and material are made to travel through the machine at high speed by the direct action of the force exerted by the nozzle of the pipe. All of the gravel and material come in direct contact with the stream of water discharged from the nozzle consequently it serves to dissolve and pulverize the gravel.

The disintegration and washing process, produced by the force of the nozzle of the machine, so thoroughly washes and dissolves the gravel in its upward passage through the elevator spout, that long flumes for washing are not necessary. The greatest amount of wear is upon the ground section and curves of the machine. This wear is on one side only; consequently the ground section and curves are made in halves—an upper and lower half, running lengthwise through the machine, with a flange turned out on each side, so that the two halves can be bolted together, and in case of repair the lower half can be replaced. The lower half is made of white or chilled iron, one and one-half inches in thickness. The object secured is grade for sluice-boxes where the natural surface of the country is level. At the "State" mine, near Pino, the company use 300 inches of water, with a pressure of 120 feet, delivered through a 3-inch nozzle. The raise here is 12 feet to the head of the inclined flume, which of course admits of a long line of sluice-boxes, as the grade of sluices is usually 3 to 6 inches to a box (12 feet in length). This would admit of 288 feet of sluice line on the steepest of grades used. The gold, however, is caught in the boxes at the head, the lower boxes rarely paying to clean up. At the Barron claim, near Columbia, Tuolumne County, gravel is raised 30½ feet with 350 inches of water. The capacity of these machines is as follows: With diameter of 12 inches at discharge curve, with 150 feet of pressure, 300 inches of water are required; 300 feet of pressure, 350 inches of water are required; diameter of discharge, 20 inches; 150 feet of pressure will require 700 inches of water; 300 feet of pressure require 1,000 inches of water.

RIVER AND BAR MINING.

The mountain rivers of California, having their sources in the snow-clad regions of the Sierra Nevadas and pursuing their turbulent career to the great valleys of the San Joaquin and Sacramento, intersect in their course the ancient channels of the Pliocene era, and are the natural

sluices of thousands of square miles of auriferous ground, the wash from which has been distributed on their beds, bars, and benches, where, by a natural process of concentration, the gold was redeposited in such manner that it was easily accessible to the early miners.

From 1849 to 1853 the rivers from Siskiyou County to Kern County swarmed with a restless population of miners, who extracted more than \$100,000,000 in value by the use of the "rocker" and "long tom"—a primitive method now only in use by the Chinese, who are still engaged in working over the same material originally washed by the early discoveries.

The deposition of gold in beds of the rivers was governed by natural laws, and was not therefore uniform. Where a river impinged upon a hard point of country rock, its course was deflected toward a more yielding material, and the consequence was a sweep or current which formed a "bar" whereon the gold effected a lodgment, while the main channel of the stream was scoured by the rushing waters until another obstruction, or an expansion of the stream formed other bars or benches. During the period of the erosion of these rivers a larger amount of water flowed than at the present time, consequently the bars of that period are now gravel benches about 30 or 40 feet higher than the present high-water level. This class of ground is worked by the hydraulic method. The river-beds were worked by damming the stream and diverting it from its course, for any distance practicable, by means of a wide flume constructed of lumber, leaving the river-bed dry.

Many of these enterprises proved disastrous failures, either by reason of the poverty of the river-beds or the sudden rise of the river, destroying and sweeping away the flume before it had been completed. Among the instances of success, however, may be noted that of the "Cape Claims," on the Feather River, in Butte County, embracing 3,400 linear feet on the river. Here two wing-dams were constructed across the river, and a flume of adequate capacity built to convey the whole body of the river from above the upper dam to below the lower one. The water between the dams was pumped out by water-power from the flume, and the bottom gravel washed in sluices. During a period of forty-two days gold to the value of \$680,000 was taken out; but only one-third of the ground was worked when the flume was destroyed. Sections of nearly every mountain stream in the State have been worked in a similar manner, and often with larger returns, but failures were likewise numerous. These rivers carry gold in greater or less quantity from the foot-hills to the high ranges, but rarely farther up than the line of the ancient channels which they have cut through. They uniformly have their source in the primitive granite of the high Sierra, and traverse alternate belts of metamorphic slates, diorite, chlorite slates, and finally talcose slates before their junction with the valley rivers. The difference of elevation between the bed-rock of the ancient channels and those of to-day is about 2,000 feet. Where gold is found on the rivers east of the ancient channels it is apparent that its origin was from the disintegration of veins of quartz, which are numerous throughout the above formations, though not always carrying gold in a profitable quantity. Thus a stream may be rich in gold below the intersection of an apparently barren ledge of quartz. Many hundreds of thousands of tons of low-grade quartz have been disintegrated by the process of nature, and the free metal deposited by the laws of specific gravity.

In the Middle Fork of the American River, between the Forest Hill and Georgetown Divides, river mining is actively prosecuted. There are many companies owning from 1,000 to 3,000 feet of river bottom having

a width of from 500 to 700 feet. The method pursued is to sink a shaft near the bank, above high-water level, to a depth of 40 to 60 feet, and drift then from under the bars in bed-rock, then raise to the gravel, which is extracted, hoisted to the surface, and washed through sluice-boxes. The water pumped from the shaft, when it is stored in reservoirs, is always ample to wash the gravel. This class of mining can be conducted at all seasons, but better in the dry than in the rainy season.

The Mammoth Bar Company, who are conducting extensive operations on the Middle Fork of the American River, own 3,000 feet of the river, containing about 40 acres. They extract the bottom gravel to a thickness of 4 or 5 feet. The gravel is raised in buckets or tubs, which contain about one-third of a ton, and yields at the rate of 70 cents per bucket. About 300 buckets can be raised in a day. Hoisting and pumping apparatus is run by water. The North Fork of the American River is principally worked by Chinese.

In the northern counties, such as Trinity, Klamath, and Siskiyou, river mining is prosecuted extensively by the fluming method. Trinity County has produced the past year about one-third of a million of dollars, of which amount a large proportion has been derived from river mining. The drainage system of the Coast Range, of the northern portion of the State, is through the Klamath River, which empties into the Pacific Ocean near the Oregon line. All its tributaries are mined by flumes.

Trinity River has extensive areas of gravel lands, or benches, 100 feet or more above the present river, probably the remnants of some great drift period. These are not connected, but lie upon points or benches of land, their former continuity having been broken by land-slides and creeks, which carry a flood head of water in rainy season. The mountain sides are steep, and not well adapted to the storage of water; therefore the washing season is short. In order to economize water during the dry season, a singular contrivance is in use on the gravel lands near Trinity Center. It is locally called a "Shot-gun-dump," but could be better described as an "automatic discharge gate." A small but deep reservoir is constructed at a suitable elevation above the bank to be washed, and the water from the ditch is conducted to it in iron pipes of 4 or 5 inches in diameter. At the lower end of the reservoir is a dam and a gate; across the dam is a beam, one end of which is attached to the gate, and the other, or lower end, has suspended to it a water-box with a valve in the bottom. This box is suspended over the water flume which carries the water to the mines. Water from the pipes is discharged into the reservoir. When it is full to overflowing the surplus water passes through a narrow box over the face of the dam into the suspended box, which is so gauged in size and weight that when full it pulls down the beam and thereby raises the gate, permitting the instantaneous discharge of the contents of the reservoir with great velocity. The valve of the suspended box drops upon an upright post; its waters are also discharged, when the gate on the other end of the beam falls by its weight; the empty box rises, and the process goes on indefinitely. The result is a sudden sluicing of the flumes, at intervals of a few minutes, with a heavy head of water.

There are many miles of the mountain rivers which are virgin ground, as their situation does not admit of fluming. In order to work these, there are now projects of tunneling across the bends or "horse-shoes" of rivers, in order to secure fall for washing the river bottoms. One of these projects on the Feather River contemplates running a tunnel a distance of 2 miles across a high point of land around which the river

flows. The company will thereby drain 11 miles of river which has not been worked, and is fairly presumed to be as rich as were the rivers in early times. Should this enterprise prove a success, many of like nature will be inaugurated.

TAILINGS.

By the term "tailings" are comprehended the disintegrated material of the hydraulic banks, consisting of sands, pebbles, and boulders, which are sluiced from their primitive beds into the natural water-courses of the mountains, and there remain banked up until the heavy winter floods successively remove them lower and lower, until they finally spread over the valleys to the great detriment of agriculture. "Slick-ins" are the fine material held in suspension in the waters which find their way to the rivers and eventually to the bay. The latter have, of course, no value, but the tailings must contain some proportion of gold which originally existed in the hydraulic deposits.

All of the mountain streams of California are covered with this detrital matter, sometimes to a depth of 70 feet. These accumulations are a serious obstacle to the prosecution of hydraulic mining, as they choke up the natural outlet of the sluice grade, and raise the beds of the stream higher in some cases than the bottoms of the gravel deposits. In like manner the settling of the "slickins" has in the course of thirty years raised the bottom of the Sacramento River higher than the level of the surrounding country, requiring a system of levees for protection against the floods of the rainy seasons.

During the early days of hydraulic operations the miners were not provided with the present nearly perfect system of sluices and under-currents for saving the gold, and a large proportion of the gold was lost with the amalgam, which finally settled upon the river bed-rock. The tailings can in some instances be removed by running long tunnels to lower streams. A tunnel of this character has been projected from Bear River to the North Fork of the American River, which, if completed, would be 2 miles in length, and would wash and drain 30 miles of auriferous tailings. The difference of elevation of the two rivers is nearly 600 feet. So far, no large undertaking of this character has been commenced, owing to the great outlay required and the length of time before returns could be expected.

Prof. J. D. Whitney, formerly State geologist of California, says in his recent publication, entitled *The Auriferous Gravels of California*, that in one instance of hydraulic washings a yield of 2.6 cents per cubic yard covered expenses, and that under favorable circumstances a yield of $4\frac{3}{4}$ cents per cubic yard may be considered the mean minimum necessary for profit in hydraulic mining. If this conclusion be correct, as it would seem to be from the data heretofore presented in this article, the conclusion is irresistible that accumulated tailings, containing on an average $2\frac{1}{2}$ cents per cubic yard, could be moved and washed with profit, since they carry with them free water.

BEACH SANDS.

The gold production from beach sands does not cut much of a figure in the returns from California. The auriferous beach sands are the result of the ocean waves washing against the bluffs which have been the outlet of ancient rivers. Thus, it is believed by some that the Trinity River once had its outlet on the Pacific Ocean. Now it empties into the Klamath River, about 50 miles from the ocean. It is probable that

the other gold-bearing streams now extinct had outlets on the ocean. The waves washing against these banks and bluffs reduce the gravel to powder, and the heavy magnetic sands and gold are concentrated by the ocean in a manner similar to that produced by the oscillation of the miner's pan in the hands of a skillful prospector. These deposits, or rather the accumulations, are erratic and migratory. It happens that when a good find is made the ocean waves and currents will in a day shift the valuable sands to some other locality. The method of working is to raise the sands to the deck of some floating vessel, convey to shore, and pass them through some form of concentrator and amalgamator. Several of the mechanical contrivances hereafter noticed have been successfully used as long as the deposits lasted, but this class of mining is of a desultory nature. The sands have the same origin as those of the mountain rivers, and it may be of interest to present in connection with this subject an analysis of a typical sample of black sands made by Henry G. Hanks, esq., State mineralogist of California. The percentage of constituents with specific gravity was as follows;

	Percentage.	Specific gravity.
No. 1. Gold of good color, amalgamating freely.....	.0003	.....
No. 2. Magnetic portion.....	16.8145	4.841
No. 3. Sand.....	40.7872	3.135
No. 4. Magnetic by heating.....	23.1504	4.694
No. 5. Residue.....	19.2496	4.557
	100.0000	

VEIN MINING.

Veins or ledges of gold-bearing quartz exist throughout the entire State of California in all rock formations, but principally in the metamorphic slates on the western slopes of the Sierra Nevadas. The greatest activity in this branch of mining is in the central portion of the State, from Plumas County on the north, through the counties of Sierra, Nevada, Placer, El Dorado, Amador, Calaveras, and Tuolumne, to Mariposa County on the south. The principal production from this source is from the counties of Plumas, Nevada, and Amador, where these veins have been worked to a depth of from 1,000 to 2,000 feet.

On the eastern slope of the Sierra Nevadas there is but one locality, of limited area (Bodie district), but its yield for the past two years has been nearly one-half of the total gold product from quartz mining.

Gold-bearing quartz attracted attention at a very early period of the history of mining in this State, but was not prosecuted on a large scale until 1860. The first stamp-mills seem to have been erected about the years 1851-52 almost simultaneously in Amador County and Nevada County. These mills had wooden stems and square stamps, and dies shod with iron, patterned after the designs in use in the tin districts of Cornwall more than two hundred years before the discovery of gold in California.

From 1860 to 1875, according to a table carefully compiled by Henry G. Langley, there had been built 390 quartz mills, aggregating 4,180 stamps. Of this number it is presumed one-half were in active operation during this period. Since 1875 no accurate data exists as to the number of mills and stamps, as the county assessors have failed to make full returns to the State officers, and no reliable statement can be made until the results of the labors of the mining department of the Census

Bureau are compiled and published. It is, however, believed that while the number of mills has not materially increased there has been a great increase in the number of stamps and the number of tons crushed annually, and consequently in the product from this branch of mining.

The early quartz mining was for a time highly remunerative, as the common stamp and the Mexican arastra sufficed to extract the gold from the oxydized quartz; or, in miner's parlance, it was "free gold-bearing quartz." When the water-line was reached the prospector removed his windlass and sunk a new shaft. In this manner the ledges were trenched to a depth of 60 or 80 feet. Below the water-line the ore became refractory to ordinary processes of amalgamation, the gold being mechanically combined with sulphides of iron, lead, and other metals, and the occurrence of the native metal being rare. Resort was had to roasting the ore in bulk in reverberatory furnaces with a view to desulphurizing, but without good result, as the ore was merely coated with a film of silica and the heart of the pieces remained unchanged. Then a rude system of concentration followed the wet crushing, the concentrates being ground and treated in the Mexican arastras. As this method was slow and expensive its use was limited to high-grade ores. The invention of the American grinding and amalgamating pans followed, with better results, and a more effective system of concentration was devised by the use of the Cornish buddle, the German shaking-tables, and blanket-washings. It was not, however, until 1863 that Plattner's chlorination process was introduced for the treatment of the concentrated sulphurets, and quartz mining became an important element in the production of gold. From this period may be dated the era of improvement which culminated in the nearly perfect methods now in use, which are elaborately described in United States Mining Commissioner Raymond's Report for 1873, by G. F. Deetken, of Grass Valley, Nevada County, who was the first to introduce the Plattner chlorination process, at the Eureka and Idaho mines of that place—a process now in almost universal use, with some modifications and improvements on the original method.

Prior to 1865 it was not considered that quartz yielding less than \$20 per ton could be mined and milled with profit. The introduction of labor-saving appliances, such as rock breakers and automatic feeders, together with improvements in the metallurgical processes, have demonstrated that rock yielding \$8 to \$10 per ton can be worked, even at great depths, with profit by steam power, and with water power the minimum grade of profitable ores may be placed at \$5 per ton, and in some cases less. The conditions in either case depend either on the price of labor and of the steam making fuel, or the cost of water as a motive power. Miner's wages are \$4 per day on the eastern slope and \$3 on the western. The price of fuel varies from \$2 to \$4 per cord on the western slope, while on the eastern it is much higher, being obtained with difficulty at Bodie at \$12 per cord. Water power costs from 16 to 32 cents per ton, according to quantity and pressure, where purchased, but is cheaper where the stream is owned by the mining company.

The Idaho quartz mine, of Grass Valley, Nevada County, may be noted as a successful deep mine, worked without any natural advantages, by shaft to the 1,200-foot level, and sinking at the present time to the 1,300-foot level. All the hoisting, pumping, and milling is done by steam power exclusively, with fuel at \$4 to \$5 per cord, and miners' wages \$3 per day. The mine is remarkably "wet," and is provided with expensive pumping apparatus. They have from the surface to the 700 level, a 14-inch pump; from the 700 level to the 300 level, a 9-inch and

6-inch; from the 800 level to the 1,000, two 6-inch; and from the 1,000 to the 1,100 level, one 6-inch. Sinking below 1,000 feet, is conducted by an engine placed on the 1,000 level, driven by air compressed on the surface. Most of the ore has been raised, during the past year, from the 1,100 level and its stopes, all above the 1,000 level being exhausted. The 1,000 level was driven 1,699 feet from the main shaft, and the 1,100 level has now attained a distance of 504 feet from the shaft. The 1,200 level drifts had attained a length of 100 feet at the close of the year 1880.

After an expenditure of about \$90,000 on the property, the Idaho mine commenced paying dividends in 1869, and with but few intermissions has paid regular monthly dividends ever since, the total number being 136 up to December, 1880, amounting to \$2,830,300 out of a total yield in the twelve years of \$6,140,188.

The yield for the year 1880 has been \$440,445.59, from which dividends amounting to \$127,100 have been paid during the year, and extensive improvements made, insuring the life of the property for many years.

The average value of the ore per ton for the past year has been \$15.82, which shows a slight improvement over the preceding year, when it was \$15.42 $\frac{3}{4}$ per ton.

The cost of milling and mining per ton for the past year has been \$9.29 $\frac{1}{2}$, which shows an increased expense over the preceding year, when it was \$8.96 $\frac{1}{2}$ per ton, which has been caused by a larger amount of developing (dead work) being performed.

The ore worked during the year was 28,072 tons, by means of a 50-stamp mill, giving the following results:

24,457 ounces of bullion.....	\$426, 938 46
68 tons of slime sold.....	2, 257 00
Tailings, worked on shares.....	5, 068 12
36 $\frac{1}{2}$ tons of tailing sulphurets.....	4, 580 72
50 tons of buddle sulphurets.....	4, 317 04
Sold 10 $\frac{1}{2}$ tons of sulphurets.....	892 85
Specimens sold.....	65 00

Total	444, 118 69
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The aggregate expenses were as follows:

Milling, mining, and repairing.....	\$260, 611 43
Cost of new machinery for sinking and pumping.....	4, 017 64
Sinking main shaft.....	7, 496 00
Prospecting and cross-cutting on 1,000 level.....	1, 578 25
Grinding tailings on percentage.....	1, 428 17
Saving sulphurets.....	2, 542 50
General account.....	12, 821 62

Total	290, 495 61
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It will be seen that the company have not segregated the cost of mining and milling, but, basing an estimate on the record of previous years and of other mines in the district, we may estimate the cost of mining and dead work at \$7 per ton and the cost of treatment at \$2.29, leaving a profit per ton of \$6.53.

The Idaho Company's method of treatment may be briefly summarized as follows:

1st. Preliminary crushing with rock-breakers.

2d. Running crushed quartz through batteries of 800-pound stamps, provided with No. 6 screens (the apertures admitting the passage of a No. 6 sewing-needle). No quicksilver is used in the battery.

3d. Concentrating the released gold and auriferous sulphides by means of blanket washing.

4th. The concentrates pass through quicksilver vats agitated by stirrers, thence through a rubbing and amalgamating apparatus.

5th. The further concentration of above product by Cornish buddles and jiggers and percussion tubs.

6th. The tailings pass over long lines of sluices, where they are again settled on gunny sacks and further concentrated.

7th. The headings and scums are treated in pans with quicksilver.

8th. The clean results of concentration chlorinated.

Result: The free gold is obtained in the amalgam vats and the amalgamated plates of the rubbers, and in the pans; the gold combined with sulphides by the chlorination process. The percentage of free gold realized is about 75 per cent. The percentage of contents of concentrates about 90 per cent. This instance has been cited, as the mining and milling machinery is elaborate, and embraces all the modern appliances and processes for hoisting, pumping, and treatment of ores, by steam-power, and the mine managed exclusively under the personal supervision of the owners.

There are many extensive quartz mines producing low-grade ores in the northern counties of the State. Among these are the Green Mountain, Plumas County, 90 stamps, worked through tunnel by water and steam power, yielding quartz of lower grade than \$8 per ton; the Gold Stripe, same county, worked by tunnel-water and steam, 30 stamps, ore \$5 to \$6 per ton; Savercool, same county, worked by tunnels, water-power, 40-stamp mill, ore \$4 to \$6 per ton. The above are either solvent or on a dividend-paying basis.

The cost of mining may be placed at \$2 to \$2.50 per ton, milling 60 cents to 90 cents per ton. Labor in those counties is \$2 to \$2.50 per day, there being no miners' union regulating wages. Water for power is abundant, and fuel may be had for the cost of cutting and hauling. The ledges are from 3 to 9 feet in width.

The Sierra Buttes and Plumas Eureka mines, in Plumas and Sierra Counties, are examples of mines working low-grade ores continuously with profit. These mines were opened in 1851, and are worked through tunnels. They have paid dividends for many consecutive years. The principal offices of the above companies are in London, England, but the resident superintendent, Mr. William Johns, furnishes the following details of the operations of the last six months of the year 1880:

SIERRA BUTTES MINE.

(Water power.)

Number of stamps	96
Tons mined	30,109
Tons milled	30,112
Cost of mining	\$3,374
Cost of milling	61 cts.

PLUMAS EUREKA MINE.

[Water power, supplemented by steam.]

Number of stamps	88
Tons mined	36,636
Tons milled	36,735
Cost of mining	\$2.65½
Cost of milling	90½ cts.

The metallurgical process in these cases is more simple and cheaper than that of the Grass Valley system described above. Quicksilver is introduced in battery, and amalgamated copper plates below battery

relied upon for catching the gold. The residue is concentrated by blanket washings and buddles, and treated either by chlorination or by trituration in pans—grinding and amalgamating.

At the Plumas Eureka, where lead sulphides predominate, the concentrates are roasted in a horizontal revolving cylinder (Bruckner furnace), where they are desulphurized and the residue worked in pans. The tailings of the mill pass to arastras, where they are worked on shares by the owners of the arastra. In this manner the company realize \$12,000 per year from this tailings or refuse.

At the Sierra Buttes the ore is more free and roasting is unnecessary. The tailings pass directly to the arastra men who work on shares, as the companies own and control the water and outlet from their mills.

The operations of the Groesh mine of El Dorado County show a remarkable example of success attending the mining and milling of low-grade quartz. The company's ground consists of a belt of auriferous quartzose rock interspersed with a low percentage of iron, arsenical and antimonial sulphides, and containing gold in a fine state of subdivision. The walls of the ledge (which in Australia would be termed a "reef") are, on the southeast side, argillaceous slates, and on the northwest metamorphic crystalline slates. The general course or strike is northeast and southwest, and the reef stands nearly perpendicular. The width of the auriferous zone is about 40 feet and the grade \$3 to \$4 per ton. The mine is at present opened on the surface from a pit 40 feet deep, presenting an open cut or face from which the rock is broken down as in a quarry. A tunnel has been run to intersect the ledge 100 feet lower than the pit and a connecting upraise finished. The rock is delivered directly to the mill platform by a tramway and cars. Miners' wages are as follows: Foreman, \$90 per month and board; first-class miners, \$75, without board; second-class miners, \$65 per month; surface labor, \$55 per month. The expense of breaking rock and delivering to mill is estimated at 62½ cents per ton, but this does not include the expense of dead-work—*i. e.*, lower tunnel.

The record for one month in the fall of 1880 showed a yield of \$3,795, or \$2.53 per ton, as the mill had then a capacity of about 50 tons per day. Since then the mill has been reconstructed and has now 50 stamps with a capacity of 100 tons per day. The mill pay-roll will stand about as follows: Superintendent, \$200 per month (one-half for mill, \$100); amalgamator, \$125 per month; assistant amalgamator, \$75 per month; clerk, \$75 per month; all the above with board; and two roustabouts, \$75 each, without board; or say a total of \$600 per month. This would be equivalent to 20 cents per ton for labor at the mill.

The mill machinery is run by water power purchased from the Parks Canal Company. The amount of water used is about 260 miner's inches, under a head of 100 feet, delivered upon a Leffel's turbine wheel set vertically. This appliance runs the 50-stamp mill with steadiness and regularity at a cost of \$16.25 per day for power and battery water. The stamps weigh 750 pounds and drop 6½ inches, 80 blows per minute. The battery screens are No. 7. The gold is caught in the battery and upon large surfaces of amalgamated plates on the aprons and sluices. The headings or accumulations in battery are amalgamated in a horizontal revolving barrel. The metallurgical process at present is extremely simple and inexpensive, as no concentrators have yet been introduced. The sulphurets are of low percentage in quantity, but of high grade. The milling expense may be estimated as follows: Water power, 16½ cents per ton; labor, 20 cents per ton; wear and tear, 20¾ cents per ton; lights, oil, loss of mercury, &c., 5 to 7 cents per ton, or say 65 cents per

ton. The total cost of mining, milling, prospecting, and dead-work is estimated not to exceed \$2 per ton.

The inventions for concentrating the sulphides in quartz are of infinite variety, and have been described in the various reports of the mining commissioner from 1870 to 1876. Those having the merit of novelty or the application of any new principle, which have been introduced within the past four years, will be briefly described at the close of this article. The aim of all is to save as high a percentage as possible of the auriferous sulphides. These sulphides vary in their value in different portions of the State. They rarely assay less than \$50 per ton, and as rarely exceed \$120 per ton. The percentage of sulphides in the quartz runs from 1 per cent. to 10 per cent.; generally it is $2\frac{1}{2}$ per cent. The chlorination custom works charge from \$20 to \$25 per ton and return 90 per cent. of the assay value of the concentrates. Where the works are owned by the mining companies the cost is about \$10 to \$13 per ton, fuel being the principal item, and a higher percentage is usually obtained than that guaranteed by the custom works.

In some of the central counties the chlorination process is preceded by roasting of the concentrated sulphurets with a mixture of sawdust in furnaces of peculiar construction. One of these processes, as described by F. B. Morse, superintendent of the Willard Metallurgical Works, Murphy's, Calaveras County, is as follows:

After the ore is crushed the pulp is mechanically mixed with sawdust and water, the ore and sawdust being in about equal bulk and the moisture being regulated to the proper degree. The mixed pulp is then carried by a screw-conveyer to the furnaces, which are charged by hand as often as necessary.

The furnace consists of a circular cast-iron ring 5 feet in diameter and 3 feet deep, resting on a cast-iron bottom, and having a false bottom about 4 inches above the other. This false bottom is perforated over its entire surface with small holes about an inch apart. The space between the two bottoms acts as an air receiver and is connected by a pipe with a "Baker blower." Under the bottom is a fire-box and ash-pit, and the whole arrangement is set and encased in brick. In setting up a pair of furnaces about 15,000 bricks are required. A small fire is built in the fire-box. This heats the lower plate and also the false bottom. The heat required on this false bottom is only enough to char or ignite dry sawdust. When this heat is attained the lower plate should not be hotter than a dull red. At this point a little sawdust is sprinkled over the false bottom and the ore charged in. The blast is then turned on; the air coming up through the holes of the perforated plate at once ignites the charge at the bottom, and the combustion slowly works its way up to the top and goes out when the charge is done. No stirring and very little attention is required, and when the fire goes out the ore is roasted, the result being under the best conditions an absolutely clear roast and at all times a practically perfect one. The furnace is then discharged upon a cooling floor, the roasted ore passed through Cornish rolls to properly size it, and carried to the chlorination building, when it is treated in the same way as in other establishments where the "Plattner" process is in use. The fire can be allowed to go out if desired after the roasting commences, but it is preferable to bank it for the next charge. The time of treatment varies from $2\frac{1}{2}$ hours to 7 hours to a charge according to the percentage of sulphurets present. The charge is one ton of ore; and one cord of wood will furnish sufficient fire to roast from 20 to 24 charges. The best conditions for roasting consist in having the ore very fine and containing a certain percentage of sulphurets. With the ore screened to 80 an absolutely perfect roast is attained. With a 40-mesh screen the result is a roast which is practically perfect, much better than the average reverberatory-furnace roast, and in all cases the roast is entirely free from sulphates. A 30-mesh screen has been used with equally good results on most ores. But with high-grade ores especially those carrying lead and zinc sulphides, tolerably fine crushing is desirable, as even an extra 1 per cent. of value extracted in such cases counts up very fast.

As for the percentage of sulphides desirable to obtain the best results, it is found that from 10 to 25 per cent. gives the best returns; so when ore carrying only 2 or 3 per cent. is worked, concentrates are usually added to it. Ore has never been roasted containing more than 50 per cent. of sulphides, and at present it is considered that the furnace is not adapted to such ores.

The advantages claimed for the furnace are: The perfection of the roast; small original cost and expense of setting up; slight expense for labor, as one man can take

care of three or four furnaces; small cost for fuel, one cord of wood answering for twenty tons of ore. As for sawdust, it can usually be obtained for the mere cost of hauling. Moreover, in case of necessity, almost any other desiccated carbonaceous material will answer the purpose, although sawdust is by far the most desirable. The furnace has been considered as particularly useful for gold ores, and so far has been used for such almost entirely.

The company has worked ores containing tellurides and gold-bearing sulphides of iron, zinc, nickel, copper, lead, antimony, and arsenic, and in every case successfully. Especially has this been so with ores containing tellurides and galena, which are usually considered very difficult to treat by chlorination. The best results have been, of course, with the highest grade ores, from which the process has extracted from 94 to 99 per cent. of the assay gold value, the latter result being obtained with a tellurium ore assaying \$350 per ton. In several runs the average assay was \$28.24, and the average per cent. of value taken out was 94.4 per cent.

The superintendent, Mr. Morse, says: "In regard to silver ores, we have never treated them on a practical scale. I have made some experimental runs with small lots of ore carrying silver-bearing sulphides, roasting them with salt and leaching with a hyposulphite solution. In one lot assaying 25 ounces I got out 20 ounces; in another assaying 15 ounces I obtained 10½ ounces; in another assaying 10 ounces I extracted 6 ounces, and from another assaying only 5 ounces I took out 1½ ounces."

The company using this system have a 10-stamp mill, furnace, and chlorination apparatus for custom work, or purchase ores for treatment by their process. All raw ores having an assay value of less than \$25 per ton are crushed wet and concentrated. Ores having an assay value of more than \$25 per ton are crushed dry. The crushed or concentrated material is treated in the same manner, varying only in the proportion of carbonaceous material used as a mixture.

In Tuolumne County a furnace of somewhat similar construction, called the Williams Desulphurizing Furnace, is in use at the Soulsby mine, with satisfactory results.

The Williams furnace is adapted to the roasting of ores that have been finely reduced and mixed intimately with hydrocarbons in accordance with the process patent issued to Henry F. Williams in June, 1880.

This furnace has two apartments, an upper or flame chamber, with a bottom having numerous small openings for air-currents (about 40 to the square foot), and an under chamber, adapted to hold air under pressure to be forced into the chamber above to feed combustion of the hydrocarbons, and the gases generated by such combustion; no other fuel being necessary to produce the heat and flame requisite to eliminate sulphur, arsenic, antimony, and other noxious materials from the ores of precious metals.

A peculiarity of this furnace is, that it commences to do its work effectually the instant the torch is applied to the material in the flame-chamber, and the steady flow of oxygen from the air-chamber below sustains combustion till all the inflammable gases produced by the hydrocarbons, sulphurs, &c., are consumed, when combustion entirely ceases for want of material to feed upon, and the precious metals are freed from the matters in the ore which before prevented their amalgamation.

The mill process in use in the central portion of the State is somewhat different from that of Grass Valley district. As an example of the method used we have selected the operation of Knox & Osborn's mill at the "Boston" mine, near Mokelumne Hill, Calaveras County.

The mill at this mine has been recently erected, and contains all of the modern improvements. It is a 20-stamp water-power mill, built on a hillside, and so arranged that the ore passes through the mill by its own gravity, and after it is dumped through the grizzly moves automatically until it escapes as tailings in the cañon below. The fall or

head of water is 630 feet; the wheel, which is of the percussion species, known as a "hurdy-gurdy," is set above the battery, and the same water which drives the wheel is used for amalgamating and concentrating, only 600 feet of the fall being utilized on the wheel.

The ore as it comes from the mine in cars is dumped on a screen called a grizzly, composed of bars of iron set longitudinally in a stout frame which stands at an angle of about 50°. These bars are an inch and a half apart, and all of the fine ore passes immediately to the ore-feeders, while the coarse portion goes to the rock-breaker and is crushed, so that no pieces are larger than hens' eggs. Falling through the rock-breaker it mingles with the fine ore that passed through the grizzly on its way to the ore-feeders.

Though fine crushing in jaw-crushing machines has not proved satisfactory, yet to a certain degree of fineness ore can be more economically reduced by a jaw-crusher than by any machine now in use.

From the rock-breaker the ore passes to self-feeders, by which it is automatically delivered under the stamps in a more uniform manner than is possible by hand-feeding, materially increasing the crushing capacity of the stamps. The mill-man can feed high or low, according to the nature of the ore. The ore is sampled as it falls from the feeder into the mortar; the previous crushing in the rock breaker allows a much more accurate sample to be taken than can be drawn from the ore in the cars.

The battery is of the ordinary California pattern, with stamps weighing 750 pounds, run at 90 drops per minute, and the screens are made of Russian sheet-iron, with slots, in fineness equaling a "forty," or with 1,600 holes to the square inch. The mortars, contrary to the rule in this part of the State, are narrow, allowing but little room inside for amalgamating plates. A wide mortar has more room for plates inside and the crushing with the same screens is finer, but not so much ore can be crushed, and it appears to make no material difference whether the gold is caught outside or inside of the mortars, so long as it is not lost. The batteries are provided with splashboard or outside plates, on which the pulp falls as it escapes through the screens. This gives a larger amalgamated surface to collect the gold than in the ordinary arrangement of plates, and is probably an improvement.

Three methods of preparing plates are in use in this mill: First, the ordinary amalgamated copper plate, where the plate is cleaned with acid or some chemical and then quicksilver applied to the surface; second, the electroplated plates, where a silvered surface is formed on the copper by electric action; third, where the copper is first amalgamated in the ordinary manner and then a thick coating of silver amalgam is applied to the plates.

Plates amalgamated in the ordinary method do not collect the gold closely at first, but must first be coated with a layer of gold amalgam sufficiently thick to prevent the copper underneath it from corroding. After this is effected the plate will act efficiently until it is worn out, and then contains sufficient gold to pay for a new one.

The electroplated plates are at their best at first, and require little care or attention until the silver plating is worn off, when they become useless and must be replated.

The silver amalgamated plates are as efficient at first as an electroplated plate, and as the silver amalgam is worn off it is replaced by gold amalgam, and the plate retains its excellence until it is worn out.

The average duty of the stamps is two tons to each stamp in twenty-four hours.

After the pulp leaves the plates it is conveyed in spouts to the concentrators. The pulp from 10 stamps, or about 20 tons per day, is worked on four Frue concentrators, and the same amount from the other 10 stamps is worked on one Blatchly concentrator. The concentration is very close; the loss in the tailings, as determined by daily samples and assaying, is only from 35 to 55 cents per ton; average loss about 40 cents per ton.

The concentrates are worked by roasting, chloridizing, and lastly reworking the tailings from the chloridizer in an iron pan to extract any silver contained in the ore.

The cost of running this mill for a month is for:

Water, \$10 per day, 29 days	\$290
One foreman, per month	100
Two amalgamators, \$50 per month	100
Two concentrators, \$50 per month	100
One rock-breaker, per month	50
One handy man, per month	50
Lights, fuel, charcoal, assays, material, &c	150
Wear and tear	300
Total.....	1,140

Or about \$1 per ton for crushing, amalgamating, and concentrating.

In Amador County the completion of the Amador Canal has furnished water-power for many mines on the Mother Lode, milling low-grade ores.

In some cases both hoisting works and mill are run by water-power. The amount paid for water and the capacity of the mill is shown in the following tabular statement:

Company.	Stamp.	Water rates per month.	Pressure in feet.	Remarks.
Lincoln	40	\$403	270	Water for milling.
Keystone	40	1,200	260	Water for hoisting and milling.
Bunker Hill	20	903	260	Water for milling.
Gover	30	550	130	
Oneida	60	1,500	225	Water for hoisting and milling.
Kennedy	20	450	170	Do.
Consolidated Amador	60	600	470	Mostly for hoisting.
Coney	40	400	.....	For milling alone.
Mahoney	40	400	.....	Do.

Each stamp may be estimated to have a crushing power of 2 tons per 24 hours, or, for a 40-stamp mill, say 2,000 to 2,500 tons per month. The actual cost of water as a motive power in crushing will therefore represent 20 cents per ton under favorable circumstances. The rate per miner's inch is about 20 cents, the relative execution depending upon the head or pressure. The ores, with one exception (the Keystone), do not yield over \$10 per ton.

The operations of the Bunker Hill mine, near Amador City, may be accepted as a representative of the "Mother Lode" mines.

The ore channel of the Bunker Hill mine is about 200 feet in width. The foot wall is black slate, and the hanging wall greenstone. The dip of the vein is 60° from the horizon. The ore occurs in kidneys near the center of the channel, varying in thickness or width from 6 feet to 50 feet. The mine at present shows one face 42 feet wide and another 38 feet wide. These kidneys, or pay chutes, are from 175 to

300 feet in length. The "free gold," or that which is readily amalgamated on plates, runs from \$6 to \$15 per ton. The average proportion of sulphurets in the quartz is $1\frac{1}{2}$ per cent., assaying from \$55 to \$120 per ton.

The hoisting and pumping machinery is run by steam-power. The pump columns are 3 inches in diameter, and four hours per day pumping suffice to keep the mine clear. The cost of mining the ore and keeping the mine clear of water is \$4 per ton. The company own 2,600 linear feet on the ledge. It has been opened to a depth of 400 feet and a length of 650 feet. The mill is situated on Rancheria Creek, at the north end of the company's ground, 2,400 feet from the hoisting works, with which it is connected by tramway. It is run by water-power purchased from the Amador Canal at the rate of 20 cents per miner's inch per 24 hours. The fall or head is about 260 feet, and the water is delivered through a nozzle upon a "Crandall" wheel—one of the numerous systems of the application of water upon the periphery of a narrow vertical wheel inclosed in a tight box. The mill has 20 stamps of 800 pounds each, dropping $6\frac{1}{2}$ inches 95 times per minute. The capacity of the mill is 2 tons per stamp in 24 hours, the discharge being through a No. 7 slot-punched screen. The mill is provided with rock-breakers and self-feeders.

The pulverized quartz is amalgamated on copper plates, both inside the battery and upon aprons and sluices outside. The sulphurets are concentrated by the Frue machine, supplemented by Hendy's concentrators, and the concentrated sulphurets treated by the process of chlorination, under an improved method hereinafter described. The total cost of milling manipulation, up to the chlorination process, is estimated at \$1.50 per ton.

The Plattner system of chlorination consists in the application of chlorine gas to finely pulverized and roasted ores, whereby the metallic gold is transformed into a soluble terchloride, and precipitated by common copperas in solution. The gold is thrown down in the form of a loose powder, which is melted with borax, and the result is a bar of great purity.

The chlorine gas is generated in leaden receivers by the mixture of sulphuric acid, salt, and peroxide of manganese, whence it is introduced into the vats containing the roasted material, which after twenty to twenty-four hours' exposure to the action of the gas is leached and precipitated.

The above method is in use in the leading mining counties of the western slope of the Sierra Nevadas. There has recently been introduced at the Bunker Hill mine, of Amador County, an improved system of chlorination known as the "Mears process," which is based upon the Plattner method, but it is claimed to be more expeditious and economical. The process consists in forcing compressed chlorine gas in the roasted ore. Chlorine is made in the usual manner in a generator of ordinary construction, and conveyed to a receptacle similar in construction to a gasometer. Connection pipes of lead lead from the receiver to a strong reservoir, into which a force pump compresses the chlorine gas to the required degree of pressure. The chlorinator consists of connecting pipes adjustable to a cylinder of iron lined with lead. The cylinder revolves on trunnions, one trunnion being hollow, to which the connecting pipe is adjusted. The chlorinated charge is dumped from the cylinder into filtering vessels with prepared bottoms, transportable on wheels to the precipitating vat, where the operation is similar to the Plattner process.

The operation in detail is as follows: A charge of 2,000 pounds dead roast is put into the cylinder, and to this 125 gallons of water added. The thorough mixing is then effected by revolving the cylinder. After having exhausted the atmosphere to prevent the adulteration of the chlorine, the charge of chlorine from the pressure reservoir is admitted until the gauge indicates the required density. The chlorine is then shut off and the cylinder kept revolving from 30 to 60 minutes. The chlorine having by this time thoroughly dissolved the gold in the dead roast, the excess of gas under pressure is allowed to pass off either into the gasometer for reuse, or into a newly charged cylinder to chloridize another ton of dead roast. The gas remaining in the water held by absorption is expelled or drawn off by means of a vacuum produced by adjusting the connections with the pump. The chlorination being finished and surplus gas discharged, the whole contents are run into leaching vats. The leaching is finished when the liquid no longer shows a trace of auric solution in the sample tested. This solution is then ready for the precipitating agent. If sulphate of iron, it is added until a test sample shows no discoloration on adding a few drops of sulphate. If charcoal, then this auric solution is run through barrels properly filled with carbon, two or more to be used for absolute security that the whole of the gold will be deposited. In the first case the precipitate is to be washed, some sulphuric acid being used to clear it of contaminating matter, and then it may be smelted into an ingot by borax. In case carbon is used, the rich gold concentrate is to be dried and incinerated, the ashes washed out and the gold smelted as usual.

Good results are obtained by employing chloride of lime without the use of the generator, gasometer, and gas pump, adding of course the proper proportion of sulphuric acid to evolve the gas immediately in the roasted charge.

The saving claimed by the Mears improvement is the expedition of the process and lessening of labor, and the saving of chlorine by reuse. The works in Amador County have not been run a sufficient time to ascertain the cost as compared with the old method, but it is claimed that the saving effected will be more than 50 per cent., thereby reducing the cost of treatment of sulphurets to \$5 per ton or less.

Bodie district, on the eastern slope of the Sierra Nevadas, although within the limits of the State of California, belongs geologically to the Great Basin system, which has no resemblance to the western slope. The country rock of Bodie is of volcanic origin, while on the western slope the formations have usually a sedimentary origin, changed more or less by the action of pressure or heat. The milling capacity of Bodie is at present 134 stamps, or about 268 tons per day. The bullion shipped during the year 1880 was \$3,063,699, of which about one-sixth was silver. This shows an increase of over half a million over the shipments of 1879. The veins occur in porphyry and the ledge matter is quartz, feldspar, with a trace of manganese. The metal is a natural alloy of gold and silver known as "electrum." The milling process is very dissimilar to that of the western slope, as there are no sulphurets in the gold-bearing veins; hence the California system of concentrating and chloridizing is dispensed with. The ores are crushed wet without the use of quicksilver, either in battery or on plates; the pulp is settled in large vats, the water being raised by pump and passed through the battery again with the ore. The settlings are worked in pans, there being one pan for every stamp. In consequence of the presence of manganese in the ore, salt and soda are added to the pan charge of settlings and the amalgamation conducted in the close pans instead of in battery or on

plates. Each pan runs about four charges in twenty-four hours. The cost of milling by this system was, in 1879, about \$7 per ton. Wood is \$12 per cord and labor \$4 per day. The expense of mining and milling is about double that of the western slope. The yield per ton has been exceptionally high, varying from \$25 to \$35 per ton in the year 1880.

POCKET MINING AND NUGGETS.

Under these headings may be embraced those erratic occurrences of gold which are a mystery to the miner and prospector and a puzzle to the scientist. The finding of nuggets in alluvial places is no uncommon occurrence. Such nuggets vary in weight from half an ounce to many ounces, and are usually worn smooth from water action and the attrition of the rocks of the stream in whose current they have been carried. Usually they bear traces of the quartz, which was their original matrix, and sometimes they consist of nearly one-half quartz, thereby denoting their origin and by inference the origin of all gold found in a natural state. It is proposed, however, to notice here only the occurrence of free gold in veins.

Gold found in its native state in the mines of California is always in the form of an alloy containing some silver. Its specific gravity ranges from 13 to 19 $\frac{1}{4}$ and its fineness from 600 to 950. The average value is usually a little more than \$16 per ounce, which corresponds to 800 in 1,000 parts. As an ore it is found combined with iron sulphides and with tellurium, in the former mechanically and in the latter it is believed chemically, though there are strong reasons to doubt the latter theory. That gold primarily existed in a matrix of quartz scarcely admits of a doubt, but it is also true that it exists in rocks other than quartzose—such as in talcose slate and in iron sulphides permeating slates and schists. In the former case it seems to be the result of mechanical deposition after removal from its home in the silicious rocks; in the latter case it exists in such small quantities as to be appreciable only by fire assay, but not in sufficient quantity to prove profitable for extraction.

There is no example in California of a mine successfully and continuously working gold-bearing rocks which are not quartzose in their nature. The so-called porphyry belts of El Dorado County are merely fissures filled with rotten and decomposed rocks, into which the gold has been mechanically deposited.

Prof. Joseph Lecoste, the eminent California geologist, holds that all metalliferous veins have been deposited from hot alkaline waters, circulating through fissures, and that in the case of auriferous veins the solvent of the gold was sulphate of iron, and the sulphate was deoxygenized by organic matter in the same solution, the gold and the iron crystallizing at the same moment, one as metal the other as sulphide, so that, although gold exists in the iron sulphide of the unchanged vein only in minute and sometimes microscopic crystals and threads, it occurs in the decomposed portion of the vein, above water-level, in visible particles and often in nuggets; hence he infers that the larger aggregations result from the coalescence of the minute particles originally contained in a mass of sulphides. In support of this theory it may be stated that the occurrence of free gold in the veins of California diminishes in depth and that the deepest mines are the poorest in specimens or pockets; the Idaho, of Grass Valley, now worked to a depth of 1,000 feet, and yielding about \$500,000 per annum, having produced less than \$100 per annum in specimens for several years past.

There are two varieties of the telluric ores known to mineralogists, the sylvanite or combination of gold with silver, and the nagyagite or combination with lead, silver, and copper. The former exists abundantly in Calaveras County, in the vicinity of Carson Hill, and in Sierra County, between the north and south forks of Yuba River. In the former locality it occurs in slate rocks, and in the latter at the junction of slate and serpentine. Nagyagite is not known to exist "in place" in California, though samples have been obtained of this ore, but it has been impossible to trace them to a ledge formation.

The ledges carrying sylvanite in both the above-mentioned localities seem to be favorable to the aggregation of large masses of native gold in proximity to the tellurides. At the Morgan mine, on Carson Hill, \$110,000 was thrown out at one blast. The gold held the quartz together in ribbons, and cold chisels were used for its extraction. Residents estimate that the mine yielded \$2,800,000 in the years 1850 and 1851, and since that period the discovery of pockets has been of annual occurrence in this formation.

The telluride veins of Sierra County, extending from Minnesota to the South Yuba, have also been prolific of pockets or aggregations of gold. The Fellows mine on this belt yielded \$250,000 from this source, although the telluric ores were not successfully worked by any process.

Aside from the telluride veins the most notable pocket localities have been in the vicinity of Grass Valley, Nevada County; Auburn, Placer County; and Sonora, Tuolumne County. In all these localities the occurrence of pockets has been in quartz rock running in veins through metamorphic slates, and in almost every instance the discovery of the pockets was the result of accident or chance, though they are sometimes systematically sought by the prospector, who, however, in this class of mining has no better theory than that expressed by Job in Holy Writ, "Surely there is a vein for the silver and a place for the gold where they find it."

It is a singular fact that the native gold so liberally diffused in the quartz should be confined to nests or pockets of limited extent but of great richness. The continuity of the pocket deposits in depth has been disproved wherever they have been sought; in fact, in most cases native gold seems to have its origin in gash or surface veins rather than in true fissures. Near Auburn, in Placer County, the "Green Emigrant" was discovered by chance within 100 feet of a road traveled for twenty years. The discoverer was an emigrant who had never seen a mine. The gold occurred in its metallic condition associated with rotten quartz in a slate formation. It was readily extracted by pan and hand mortar. After yielding about \$160,000 a mill was erected, but no more pay rock was found.

The "Reece pocket" of Grass Valley contained \$40,000, and was worked out in less than a month by hand mortar. Another famous pocket in that district was discovered by a casual visitor who was there in search of health, and who had never seen gold in any other form than the coin of the commonwealth. This yielded \$60,000, when all traces of the precious metal were lost, though much money and labor were devoted to further search. In one instance a smooth nugget containing \$640 in gold was picked up in a garden path used for many years by the occupant of the premises. There was no ledge in the vicinity. This piece was about half gold and half quartz.

Both the above-named districts, however, contain mines of permanence, where the pay has been regular and steady in true fissure veins of 1,000 feet in depth, which are still yielding.

Sonora, in Tuolumne County, is another famous pocket locality. Bald Mountain, near that place, is a hill of talcose slate permeated with narrow seams of quartz in which pockets varying from \$10,000 to \$40,000 have been found for many years past. They are soon worked out and others sought. The most celebrated pocket mine of the present time is the "Devol" mine of Sonora, situated only a few feet from the main street of the town. The company, consisting of three partners, took out over \$200,000 during the last year without works or mill. Half of this amount was taken out in a period of three weeks. The veins are narrow and the gold of erratic occurrence in nests and benches. This company are still prosecuting their search, but in a more systematic manner, by deep sinking.

The largest nugget produced by California was found in the Monumental quartz mine of Sierra County, in 1869; it weighed 95½ pounds and was valued at \$21,156.52. The gangue matter of the vein was decomposed quartz. The nugget was found 25 feet from the surface. In this case the gold suddenly ceased to exist as unaccountably as it occurred.

The "grit specimen," which was exhibited in the Paris exhibition, was found at Spanish Dry Diggings, El Dorado County. Its value was about \$4,000. It consisted of imperfect arborescent crystallizations. The nest or pocket which formed its home produced about \$8,000 more in value of the same character. This ground has remained unworked for several years, and the presumption is that the gold occurred only in aggregations of the native metal.

Pocket mining continues to be an element in the production of the precious metals, and doubtless many pockets as rich as those discovered await the miner's pick and shovel. The business is precarious, but it has a strange fascination incident to its uncertainty and the sudden reward attending success. The pocket miner's "outfit" is simple and inexpensive. It consists only of a few days' rations of "grub," and pick, pan, and shovel. With these the prospector enters on his campaign and returns to headquarters only when his provisions are exhausted. The most favorable time for his search is after a rain-storm, as the surface is cleared and the rock exposed. Every crevice presenting quartz indications is panned, and when colors are found a trench is run, following the vein, and sinking prosecuted wherever the vein shows richest in gold. Where the metal is much diffused a Mexican arrastra is erected on some convenient stream and the decomposed quartz and slate wheeled to the arrastra, which usually runs by water power, and though slow in action is very effective as a saver of gold.

SEAM DIGGINGS.

The class of ground known as seam diggings is of a purely local character, existing only in the central portion of the State, and there only on a limited area. They consist of decomposed bed rock, filled with irregular seams of quartz, containing both gold and sulphides. The seams or veinlets run in every direction irrespective of any uniform dip or angle, and not presenting any evidence of uniting at depth in ledges, although some of the seams are of sufficient magnitude to be properly classed as veins. This formation has been worked for many years by the hydraulic process, but lately, owing to the introduction of improved crushing machinery hereinafter described, it has been considered feasible to crush the tailings or residue in the Huntington mills, concentrate the heavy material and treat it by chlorination. The seam

diggings received great attention from the assistants of Prof. J. D. Whitney, who for several years had charge of the geological survey of California, and their mode of occurrence has been described by W. A. Goodyear and Amos Bowman, of Professor Whitney's staff, but the material was not published by the State.

At Georgia slide seam diggings have been worked by the hydraulic method to a depth of 175 feet, and thence in depth by shafts and drifts, whence the material is hoisted and crushed in mills. Although the quartz seams are not uniformly gold bearing, it is found feasible to crush the whole mass, and is thought that it would be highly profitable if large mills could be run by water power, as the inclosing rock, a soft decomposed slate, carries fine gold—probably the result of the decomposition of the quartz veins.

At Spanish dry diggings, the country rock is slate and fine-grained sandstones, misnamed porphyry in this country. The whole formation is filled with crystals of iron pyrites in cubes, and traversed by numerous small veins of quartz in an irregular manner. The formation abuts in its dip upon a belt of serpentine which traverses the country, near Greenwood. The seam diggings occur in a fine-grained argillaceous slate and sandstone, associated with a fine conglomerate of the character of breccia, and a porphyritic slate composed of a base of silica and blotches of feldspar. This peculiar formation intersected by pockety veinlets of quartz covers a large area of the central portion of El Dorado County, and has with few exceptions been worked by hydraulic head and sluicing. They bear such a close resemblance to each other that they do not require description in detail.

The California Water Company own many claims of this character, and with a view of ascertaining the auriferous contents, had several experimental working tests made, from which as a matter of interest in the product of this class of ground, the following may be cited as examples:

	Working test.	Yield per ton.	Remarks.
	<i>Pounds.</i>		
Nagler claim	35	\$1. 31	
Do	35	1. 18	Contained 1 per cent. of sulphurets.
Nagler tailings sample (below sluice head) ..	32	1. 40	
Crane's gulch tailings	45	. 31	Contained 2 per cent. of sulphurets.
Crane's gulch lode	48	1. 01	
Nagler porphyry	32½	17. 00	One piece of free gold vitiated the assay.
Nagler sulphurets	1	325. 00	} These were concentrates.
Crane's gulch sulphurets	1	678. 00	

The auriferous character of the mass is satisfactorily demonstrated, and the problem remains to be decided by what economical method the seam diggings may be worked.

INVENTIONS AND IMPROVEMENTS.

The various appliances of mining and the metallurgy of gold in California have been described from year to year in the reports of the United States commissioner of mining statistics in able papers by Prof. W. T. Blake, until the suspension of that office in 1876. Since that time many inventions have come into popular use, and descriptions are herewith annexed, which are necessarily brief and concise, as the character of this work does not admit of the necessary illustrations.

THE DODGE ORE CONCENTRATOR.

This machine is a percussion-table concentrator. The table is inclined and set in a frame, and so arranged that an end-shake is imparted to it by means of a cam attached to the revolving shaft of the machine. This cam throws the table forward by striking against a lug or tappet, and at the end of the stroke a steel spiral spring draws it back, causing the table to strike against buffers, whereby its motion is suddenly arrested and percussion produced. This action is continuous, and it is not necessary to stop or slow down the table to bring forward the concentrations to the point of discharge. This is effected by the action of the machine itself. The pulp from the batteries passes into sluices, thence on a distributing board provided with spreaders, and is thus delivered in a thin stratum in a state of suspension with water to the table. The sharp, short, and rapid percussion blows of the table causes the ore so to arrange itself that the heavier mineralized portion sinks on to the table and the lighter portion, or worthless gangue, passes off with the water. There is a well or depression in the upper end of the table extending across it. A riffle is placed on the table under the spreader, which checks the heavy material from passing down, and when checked the percussion action of the table tends to move the heavier particles up the incline of the table till they reach the well or depression, where they are caught and passed out of the discharge hole to a suitable receptacle. The lower end of the table is formed with a concave space to catch any mercury that may be in the pulp. The table is arranged with screws, so that its incline can be adjusted to any angle suited to the material under treatment. The frame and movable parts are all of iron.

THE DODGE ROCK-BREAKER.

This machine consists of two converging jaws, one of which, carrying the die, is fixed, and the other, to which is attached the shoe, has a working or oscillating motion. The working or oscillating motion of the arm on levers carrying the shoe is effected by means of an eccentric placed on the driving or pulley shaft of the machine. It differs essentially from other rock-breakers, in the fact that the fulcrum, or point on which the arm or lever oscillates, is placed at the lower end of the arm or lever, instead of at the upper end. By this arrangement of the parts the aperture of discharge, at whatever size it may be fixed, and it is variable, remains constant, whereby the rock discharged, after being crushed, comes from the machine of no dimensions larger than the width of the aperture. In other words, if the width of the aperture is fixed at one-half inch the crushed rock never exceeds one-half inch, but is found to be from that size down to dust, whereas in rock-breakers, as ordinarily constructed, the swing of the oscillating jaw from the fulcrum above, on the back stroke, allows the rock, *coarse as well as fine*, to pass through the aperture of discharge after being crushed. This is a most important distinction, and has been received with favor generally by mill men on the Pacific coast. These machines are made of three sizes, taking rock of the following dimensions: 12 by 8 inches, 8 by 7 inches, and 6 by 5 inches, and weigh respectively 3,500 pounds, 2,000 pounds, and 1,500 pounds. Their capacity is from 12 tons to 30 and 50 tons, according to size, per day of 24 hours. They operate best at speeds varying from 300 revolutions to 250 or 225 revolutions per minute, according to size. The largest size requires about 8 horse-power to drive it; the second size about $4\frac{1}{2}$, and the smallest size about 2 horse-power.

PAUL'S AMERICAN ARRASTRA.

This is an invention by which pulverizing, amalgamating, and settling are effectually done in one machine, thus saving the expense of several separate ones, so that with suitable preliminary crushing machinery it will make a cheap substitute for quartz mills. The ore, which is first reduced by any kind of reducing machinery to the fineness of, say 16 or 20 screen, is delivered by water or hand into the arrastra at two places in the outer circle, and between the iron and wooden rims which form the outer circular trough. As it flows in, during the revolution of this outer circular muller, the openings in this continually receive a given quantity of ore, which immediately passes under the muller, and is reduced by its grinding power. This muller travels at the rate of 300 feet per minute, and as the feed cannot be otherwise than very regular, it does not allow any contact of iron to iron. By the movement of the water, as fast as the ore is reduced it passes out under the muller, and falls into the arrastra part, where the drags take it and operate upon it for amalgamation, and further gently triturating the material, thus reducing any part not fully pulverized, and forcing the amalgamation where required. These drag shoes, which weigh 220 pounds, are so formed underneath that they keep the material on a continual sway back and forth, and opposite to the circular travel. The drags are so formed as to always ride the ore, and to do five times the execution of regular Mexican arrastra drags, from the fact, firstly, of their having three points of feed, and also from their riding the ore instead of pushing it before them, as does the Mexican arrastra drag.

In the arrastra part the quicksilver is introduced, being put in from time to time as ordinarily done in working the old Mexican arrastra, and according to the richness of the ore. In the bottom circle of this arrastra part is a groove, to which an amalgam safe is attached, so that as fast as the metals are amalgamated the mercury carries the amalgam into the safe and leaves it there, while the mercury travels on and out for reuse, without any water or sand following it. The process continues with every revolution of the drags.

When sulphurets accumulate in any quantity, they are "washed down" by drawing the lower plug and running out for an independent and more thorough treatment. This arrastra below stamp batteries working gold ores will, it is claimed, secure the finest gold, and to a degree which no other wet working machine is capable of doing. In working, no skilled labor is required. It is well adapted for working tailings or blanket washings. For an arrastra 8½ feet in diameter, 5-horse power is required; the weight is 4½ tons, and capacity from 7 to 10 tons per 24 hours according to hardness or softness of ore, and also to a degree of fineness to which the ore is reduced before entering the arrastra.

THE RICHMANN ROCK DRILL AND AIR COMPRESSOR.

This drilling machine is composed of very few parts, consisting mainly of the cylinder, solid piston holding the drill, the bar with perforated button at each end, which works automatically without gearing, and effects the forward and reverse stroke of the drill; the chuck, the clamps, the ratchet piece, and the column. This machine is so constructed as to make a perfect air-cushion at both ends of the cylinder; entirely dispensing with springs or rubber to lessen the jar, and runs at highest speed without the possibility of striking or injuring the heads of the cylinder. The parts are made of the best and hardest steel.

The chuck for attaching the drill to the machine requires less time and secures the drill more firmly than the mode in ordinary use.

The drill is secured to the column by a simple and effective steel clamp. This clamp is easily and rapidly operated, is firm and strong, and holds the machine close to the column while it allows free motion in every direction. The column can be extended two feet, as now made, or to any length desired, and admits of a longer extension than the old style of column. The extension has bearing along the whole length, making it perfectly firm and steady, and, having no exposed screw, all liability to clog or bind in its working is avoided.

The piston makes a perfect air-cushion, and requires no packing whatever.

Perfect regularity of rotation and stroke of the drill is secured, which insures a round hole even when a flat drill is used. All the working parts of these drills are inside the cylinder. The valve also cushions on and is operated by air only.

The rotation of the drill is certain in its action; the drill makes about 100 turns per minute, and about 1,200 strokes or blows per minute, or 12 blows to every turn. It feeds 18 inches, and the length of stroke is 3 inches. These drills are now being made two sizes: No 1 is a light drill $2\frac{1}{2}$ inches diameter of cylinder, and weighs 135 pounds. It is fitted for $\frac{3}{4}$ -inch steel and will drill holes $1\frac{1}{2}$ inches in diameter, and being small and compact is particularly useful in working in narrow stopes. No. 2 has a 3-inch cylinder and weighs about 155 pounds, and is adapted for heavy work. It will drill holes 2 inches in diameter, and feeds 20 inches. Its stroke is 3 inches.

The aim in the construction of this drill has been to secure simplicity and lightness with the greatest strength, space, and power. It is claimed that these results have been obtained, and that it requires less than one-third the quantity of air consumed by any other drill.

The compressor that furnishes the air to operate these drills has several new features, some worthy of especial attention. It consists of a hollow bed-plate about 4 by 3 feet, from which rise four hollow cast-iron columns about $3\frac{1}{2}$ feet to 4 feet high and 6 inches in diameter. These columns, which, together with the hollow bed-plate, form the receiver for the compressed air, are separate pieces and are removable from the bed-plates, whereby the weight of the heaviest piece is greatly reduced for easy transportation. By this arrangement is avoided the unnecessary expense of a separate air-receiver.

The air-pump is bolted to the top of the iron plate that binds together these hollow columns at their upper ends, and the entire structure is about $6\frac{1}{2}$ feet high.

The cylinder of the air-pump is double acting, and is provided with double piston rods, which allows the greatest amount of valve surface, and gives a steady movement to the piston, preventing unequal wear.

The construction of the crank is peculiar and delivers the full pressure of the steam or water power at the point of greatest pressure of the air, permitting no waste of power whatever. They are operated either by steam or water power.

The air-cylinder is provided with a water-jacket supplying a constant circulation of cold water, and maintaining a uniform temperature around the valves and entire length of cylinder. No water enters the cylinder and the air is delivered into the receiver free from moisture.

The valves open with the slightest pressure of the atmosphere and instantly close. They are made of phosphor-bronze, as also are the valve-seats, piston-rings, bushings, and stuffing-boxes. They are all

easily removable for examination without disturbing any other parts of the machine.

Each compressor will operate 1 to 9 drills of the largest size according to size of compressors. The revolutions of the driving shaft of compressor vary from 120 to 150 per minute. The weight of compressor is 2,000 pounds to 2,500 pounds, according to sizes. These drills, with an air pressure of 100 pounds per square inch, will drive a 2-inch hole into hard, compact granite, to a depth of 12 inches in four minutes, and a hole 1 inch in diameter has been driven into hard quartz in two minutes to the depth of 7 inches.

BLANDING'S COMBINED CRUSHING, PULVERIZING, AND AMALGAMATING PAN.

This pan consists of the following parts: A muller having shoes attached to the lower face and dies to the upper face of muller-plate, also dies in the bottom of the pan secured in the ordinary mode; a ring-die extending around the inner side of the pan; this ring-die has three or four cams, or as many as may be desired, placed at equal distances apart, and forming part of the ring-die, in which they are securely made fast, and rollers 8 inches in diameter, in number 12 or 14, weighing each about 90 pounds, which operate on the dies on upper face of muller-plate.

Operation of pan.—Motion is given to the muller by any suitable kind of gearing, the speed being 80 revolutions per minute.

The rollers resting loosely on the dies of the muller-plate, the motion of the muller is imparted to them, and they are thrown out by centrifugal force against the ring-die, and in their rotation with the muller ascend in regular sequence the incline planes of the cams, and on reaching the highest point of the cams are thrown horizontally against hard steel pieces set in the ring-die, and thereby exert a crushing blow, similar and equivalent in action and effect to that of the ordinary stamp mill. The rollers, having rotation on their own axes, also grind on the dies of the muller-plate, on which they rest. To these two operations of crushing and grinding is to be added a third action, viz, the grinding of the shoes attached to the lower side or face of the muller-plate, on the dies secured to the bottom of the pan.

The ore is fed from a rock-breaker, in size $\frac{1}{2}$ inch and smaller, direct to the pan, the crushing and pulverizing proceeds, and when fine enough the muller is raised $\frac{1}{4}$ inch, the rollers are hung up by a suitable device of simple design, and the quicksilver is added, and the charge of ore amalgamated.

The object of raising the muller and hanging up the rollers is to break contact and prevent grinding and consequent loss of the quicksilver during the act of amalgamation.

The purpose in this machine has been to combine the battery system and pan system of reduction. These pans require 6 to 7 horse-power to operate them at a speed of 75 to 80 per minute, and they reduce of silver ores about 7 to 8 tons, and of gold ores about 9 to 10 tons per day. They are 5 feet in diameter and 3 feet in depth, and weigh 4,000 pounds.

THE TRUE ORE CONCENTRATOR.

This machine may be described as an endless belt of india rubber revolving slowly around drums placed in a frame, to which a quick lateral oscillating motion is imparted by eccentrics and eccentric rods

or straps. The frame or table has an inclination from 4 inches to 12 inches in 12 feet, varying with the ore, and the travel of the belt or progressive motion upwards raises from 3 feet to 12 feet a minute according to the ores. The frame or table has about 200 shakes or lateral oscillations per minute. The ore as it comes from the mill is distributed by an ore-spreader onto the belt, in connection with a clear-water distributor in the form of a wooden trough, which is supplied with water by a perforated pipe, and the water discharges on the belt in drops by grooves $1\frac{3}{4}$ inches apart. As the ore passes onto the belt and is subjected to the combined action of the upward revolution of the belt and the quick lateral oscillation or shake, the sands and water flow downward to the lower end of the belt, where they are discharged as waste, and the sulphurets or other mineralized portion of greater specific gravity adhere to the belt and travel with it in its upward course, passing over the upper drum into the concentration-box placed below the frame or table, in which they are saved by being washed from the belt and deposited in the box. This concentration-box is supplied with water kept at the right height to wash the surface of the belt as it passes through. The capacity of the machine may be stated to be two concentrators to a 5-stamp mill, or about one to every $3\frac{1}{2}$ tons reduced in the ordinary stamp mill. The weight of the machine boxed for shipment is 2,200 pounds, and no part weighs over 250 pounds. The power required to operate it is very small.

THE BLATCHLY ORE CONCENTRATOR.

This is a double combination of the Rittenger percussion tables. It consists of a strong wooden frame in which tables are arranged in pairs one above the other, set at an angle varying according to the nature of the material worked from 3° to 6° . A cam throws each pair of tables apart, and springs throw them against each other 240 throws per minute. The pulp from the batteries is applied to the upper outside corners of the upper tables, and passes in a slow-moving stream on the outside of the tables. The percussion draws the heavier particles, not against the stream, but out of it sidewise, the force of the current assisting the percussion. The clean concentrates pass off at the inner corner of the lower end of the tables; the middle stuff, containing some sand and some sulphurets, passes to the next tables below and is re-worked three times; the refuse passes off at the outside corner of the tables. The capacity of the largest size is from 40 to 60 tons per day, equaling the capacity of a 20-stamp mill.

HUNTINGTON'S OSCILLATING STAMP MILL.

This machine is out of the usual track of invention in this line, being really a stamp without stems, cams, or tappets. It consists essentially of a bifurcated arm or hammer, to the upper end of which is attached, by a wrist pin, the pitman for oscillating it back and forth. At the lower end of this arm or hammer are the shoes that act on the dies placed in the mortar. As the arm or hammer is oscillated, first one shoe, then the other, strikes alternately on its respective die.

A peculiar feature of this mill, owing to its novel construction, is that a grinding as well as crushing action is secured, a small space or room for play being left at the end of the mortar, so that the shoes have about $1\frac{1}{2}$ inches slide or grind on their respective dies. This is found to be an important improvement in cases where the gold is tarnished or

rusty, as this grinding action serves to brighten the particles of gold and thereby prepare them the better for amalgamation. It is, in effect, a combination of the stamp mill and arrastra. The alternate working or oscillation of the bifurcated arm or hammer brings first one shoe in contact with the ore on its die, and then the other in its turn, the ore being thus crushed and the whole weight of the hammer never having to be lifted. When, however, the hammer begins to fall, all the weight of both arms of the hammer is imparted to the blow that the falling one delivers. Very little power is required to operate the hammer, the end or point of one arm of the same acting as a fulcrum upon which the other is raised. In practice the power to drive it has been found to be about $2\frac{1}{2}$ horse, the pitman making 140 strokes per minute, which gives to the two arms of the hammer 280 blows per minute. The weight of this mill complete is, smaller size, 3,600 pounds, larger size 5,000 pounds. Its capacity per day of 24 hours, largest size, crushing rock of ordinary hardness, through a wire screen of 40 mesh, is 7 to 9 tons. Water is supplied to the mortar as the operation of crushing proceeds.

REDSTONE'S COMBINED CRUSHING AND GRINDING MILL.

This mill may be said very properly to be a combination of the ordinary stamp mill and the arrastra. It is circular in form, the sides or curb of the mill being of cast iron, about 2 feet high and about 16 to 41 inches in diameter, more or less, according to size of mill and number of stamps. To the inner sides of the curb are bolted cams, and tappets are attached to the stems, these tappets being provided with steel anti-friction rollers, whereby the ascent of the tappets up the incline planes of cams is facilitated and friction reduced. The horizontal arms carrying the stems, which latter are free to move vertically in slots at the ends of the arms, are firmly made fast to a central vertical shaft, to which rotary motion is given by suitable toothed gearing overhead. The distinctive feature of this mill, and for which especial merit is claimed, consists of the arrangement of parts by which the stamps after falling and doing *crushing duty* continue to drag on the dies for the distance of 6 and 8 to 12 inches, according to size of mill, before they are picked up again, and thus produce a grinding effect, each stamp in its turn having this double action of crushing and grinding a number of times, equal to the number of cams in the mill, for each revolution of the central shaft. The cams are in numbers 7 to 16, according to the size of mill. The stamps weigh from 45 pounds to 640 pounds, in the mills of different sizes.

STEIGER AND KERR'S CONTINUOUS DISCHARGE CRUSHING AND GRINDING PAN.

This pan is designed to receive the ore direct from a rock-breaker and reduce it to a fineness suitable for amalgamation of gold ores on copper amalgamated plates outside, or treatment of silver ores in the ordinary silver-reducing pans. The ore is prepared for this pan by any good rock-breaker, crushing it down to the size of half inch, thence it goes to the pan and is discharged through screens placed on the side of the pan of sufficiently fine mesh, say from 40 to 60 holes to the linear inch. Enough water is added to the pan during the operation to cause the ore as it is reduced to flow readily through the screens.

The reduction of the coarse ore ($\frac{1}{2}$ -inch size) is effected by rollers, which rest loosely on the muller of the pan, which revolve with the

muller, and are thrown out by centrifugal action against a ring-die of hard iron bolted on the inner side of the pan. These rollers also grind the ore on their bottoms as they revolve on the shoes attached to the face of the muller-plate upon which they rest, the revolution of the muller giving motion to the rollers. The capacity of this pan on ordinarily hard rock through screens of 40 mesh is about 9 to 10 tons per day of twenty-four hours. The pan is 5 feet in diameter and revolution of muller 70 to 75 per minute. The weight of this pan is 6,000 pounds; largest piece 1,500 pounds. The power to drive it at highest speed, 75 revolutions per minute, is 6 horse.

I am indebted to Mr. A. F. Schneider, of Salt Lake City, for the following notes on argentiferous lead ores and their treatment in Utah (near Salt Lake City):

The mines in the Cottonwoods and Bingham Cañons, with those near Stockton, have heretofore furnished the larger portion of argentiferous lead ores treated in Utah. The southern district, near Frisco, has produced some, and expects to produce larger quantities hereafter. At present the smelting works near Salt Lake City are principally supplied by ores from the aforesaid cañons, and the past and present treatment of these ores will be considered here. Idaho, Montana, and Nevada send ores to the Salt Lake market to be treated.

During the exciting times of the large out-put of the Emma and Flag-staff mines, in Cottonwood, and Last Chance and Winnamuck mines, in Bingham Cañons, smelting works sprang rapidly into existence. The smelters obtained a good price for handling the ores; a large allowance was made for losses. No scientific work was thought of, and all were animated by the one idea of putting through the furnaces as much ore as possible without regard to other matters. The sampling and assaying were more or less carelessly done. Weighing, sacking, and handling shared the same bustle and negligence. The consequence was that after a time most of the smelting works were compelled to close, only a few having made any profit. No accurate accounts of losses, no certain weights of fuel, flux, or ore, throwing away by-products, all tended to bring about a lull in the works of the smelters. A lead refinery had also been started to refine the silver-lead bullion, but also succumbed to similar causes.

After some time one of the smelting works started one furnace on custom ores in 1875; it was watched with interest as an experiment. By good business management it was made a success; others followed the example, and a different class of men were put in charge. Economy became the rule instead of the exception. A severe competition ensued, resulting in saving the by-products, improving furnaces, and calling in scientific men with practical experience. From that time on the smelting works in Utah have progressed, until to-day several of them will compare favorably in their economical metallurgical practice with the European works. In 1878 the refinery referred to started again under a new management and also became a success.

THE ORES.

When the mines were first opened the ores were principally carbonates; those of the Cottonwoods containing iron in excess, the Bingham ores silica; though the former contained some arsenic, generally the ores were quite pure, averaging low in silica; but little flux was required; the percentage of lead was high, and the ores ran well up in silver. Hence, although fuel was dear and labor high, the ores could be handled with profit. To-day this is all changed; fuel, labor, and materials are a third cheaper, but to offset this the ores have undergone a change. The Cottonwoods have fallen off in production in comparison with Bingham. The ores average lower in lead and silver; silica averages two or three times higher. Another cause of increased relative cost of treatment is, that the ores are becoming more impure every year; sulphurets, pyrites, &c., are now found in most ores. Zinc is becoming unpleasantly prominent. Roasting had to be resorted to, making the processes now used in smelting partially roasting and reduction, instead of reduction only, as formerly. At present only custom works are running near Salt Lake City.

Ores from the Oquirrh and Wasatch Mountain ranges, from Montano, Idaho, and Nevada are brought to the sampling mills at Sandy or Salt Lake City. One-tenth, one-third, or one-fourth, or what part the owner desires, is crushed to one-quarter inch diameter and then sampled. Three small glass bottles (sample bottles) are filled with the fine steam-dried ore and given to the owner, the sampling mill keeping a fourth bottle. The owner has an assay made of the ore by a public assayer, and then offers the ore to the various smelting works and commission ore-buyers. The highest bidder obtains the ore. The price offered varies with the kind of ore and what it

contains; the total metallic value is calculated, 5 per cent. silver, 10 per cent. lead, 50 per cent. gold, being deducted for losses in smelting (though this is in excess of real losses), and then so much is deducted for smelting, cost and profit. For example, value of ore \$100 a ton, assumed smelting loss \$7 a ton, working cost and profit \$23 a ton. The owner would get \$70 a ton for his ore; these figures are arbitrary, as sometimes only \$12 to \$15 are counted for the last item. The buyer receives one of the sample bottles and makes a check assay; if there is a large difference between the original and check assay, the assays are rechecked, and a compromise effected between owner and buyer. The ore is sent from sampling mill to the smelter as soon as sold.

There are three works near Salt Lake City now running; the Mingo at Sandy, Morgan five miles from the city, and Germania seven miles from the city. Educated metallurgists have charge of all these works. The process employed is similar at all of them. The impure ores undergo roasting and reduction; pure ores reduction only.

METALLURGICAL PROCESSES.

The impure ores are crushed fine (one-fourth diameter) and roasted in long reverberatory furnaces, whose hearth is 40 to 45 feet long, 10 to 12 feet wide. The ore is charged at the far end, 2,000 to 2,500 pounds at a time, and moved from door to door by long-handled iron paddles. The capacity of the furnace is 8 to 10 tons a day; a charge remaining 24 hours in the furnace; two men per shift of 12 hours required. Soft semi-bituminous coal used as fuel answers very well.

The roasted ores are sampled, and the samples, with the samples of the pure ores, are sent to the laboratory for analysis. The ores are analyzed quantitatively for silica, iron, lime, magnesia, alumina, and manganese (sometimes for the alkalis, basic, sulphate, &c.) and such impurities as copper, arsenic, antimony, sulphur, &c. As the ores often come in small quantities from 500 pounds upwards, and every ore is analyzed to a greater or less extent, much work is required in the laboratory and incessant watching at the furnace, the ore out of the same mine varying in its composition; the principal constituents must be determined for every lot.

The fluxes used are iron ore from Tintic district, a hematite, containing 55 to 60 per cent. metallic iron (sometimes 3 to 4 per cent. manganese), and limestone, very pure, from north of Salt Lake City. A magnesian limestone is sometimes used. A jaw-crusher is used to crush the fluxes to pieces about 4 inches in diameter.

A charge is calculated, the slag desirable being between a sub and singulo silicate. On the kind of ore depends the relation of the bases in the slag; ferruginous ores allowing of a slag containing much iron. With non-ferruginous ores a slag with a large percentage of lime is more economical, as limestone only costs one-fourth what iron ore does. Magnesia, manganese, alumina, and zinc, as well as the impurities, must be taken into consideration. The charge is given to the weigher, and the ores and fluxes are weighed accurately in a wheelbarrow, as a few pounds in a 500-pound charge make quite a difference in the slag. The charge is then dumped at the furnace door.

The furnaces are shaft furnaces, either rectangular, square, or round in section, having a bosh of about 70°. From tuyeres to charge door is 12 to 15 feet. Water jackets and brick are both used for the lower part of the furnaces, though the latter are being abandoned. Automatic siphon tap is used for the lead; closed breast, with a tap-hole for slag and matte. The crucible is about 23 inches deep, and when the furnace is blown in there is enough bullion charged to fill it.

Fuel is charged at the feed door in alternate layers with the charges. Both coke and charcoal are used in varying proportions—80 per cent. coke and 20 per cent. charcoal to 40 per cent. coke and 60 per cent. charcoal. A large percentage of charcoal aids in driving the furnace fast, but causes a large amount of fine dust; by its crushing it sometimes causes irregularity in working; 13 per cent. to 14 per cent. fuel is used on the charge, even as low as 12 per cent. sometimes. The amount of lead in the charge ranges from 10 per cent. to 30 per cent.; $6\frac{1}{2}$ per cent. lead charge has been successfully smelted.

CHEMISTRY OF THE PROCESS.

Roasting is the driving off of impurities, like sulphur, arsenic, &c., by means of oxidation, under influence of heat. In the shaft furnace the carbon of the fuel reduces the carbonates and oxides, and the iron decomposes the sulphides and arsenides in the ore; copper also takes up the sulphur, and if there is not enough of the latter present to satisfy the copper, disaster portends for the siphon tap. Iron, lime, magnesia, and other bases go to make slag, with the silica. These slags vary in composition from 27 per cent. to 32 per cent. silica, 12 per cent. to 25 per cent. lime, 35 to 52 per cent. oxide of iron, and 2 per cent. to 10 per cent. other bases. How much of each of these ingredients the metallurgist will have in his slag will depend on the composition of the ores, he choosing that slag which requires the least costly flux.

The resulting products of smelting are lead, containing silver, gold, and more or less impurities, depending on the skill in smelting (this product is called silver-lead bullion, base bullion, or merely bullion); matte, a sulphide of iron principally, containing also sulphide of copper, some silver and lead; speiss, arsenide of iron (Fe_4As or Fe_5As), holding a little silver and gold.

The bullion is tapped out by the siphon tap and cast into bars; matte and speiss, coming out with the slag at the breast, flow into an iron pot. The speiss, being heaviest, settles at the bottom, matte next, and slag at the top. When cool the pot is emptied on the dump. The mass is broken, and if the slag was good a complete separation will have taken place of the speiss, matte, and slag. If the charges are rightly calculated and the copper driven into the matte, the siphon tap works well and does not clog up.

The lead bullion is shipped to refiners, where the lead, gold, and silver are separated. The matte is broken into small pieces, 2 inches in diameter, and roasted in open piles, a layer of 12 inches of cord-wood being used to start the piles. The piles are turned two or three times, each time on more wood, and when sufficiently roasted the matte is put through the furnace again, the iron serving as a flux. The copper in the matte, by judicious working, is concentrated, and after being roasted and put through the furnace three or four times a copper matte results, containing 35 to 40 per cent. copper, some lead and silver; this is sold to copper works. The speiss is thrown away, as it does not pay to work it; not that it cannot be worked here, but it is not profitable commercially. The lead bullion runs from 80 to 150 ounces in silver and 0.3 to 2 ounces per ton in gold.

LEAD REFINERY.

The Germania refinery, now running, refines the base bullion produced by the Germania Smelting Works and such bullion as it can buy in the market. The Parkes zinc-desilverization process is used, and Faber du Four furnaces for retorting the zinc scum. Sometimes the zinc scums are treated in a blast furnace (Flach's process), owing to commercial reasons, but it is not good metallurgy.

The base bullion is charged in a large reverberatory furnace, capacity 20 tons. In the first stage of the operation the copper, subsulphides, &c., rise to the top, under the influence of a low heat; these are drawn off, and the furnace heated to a high temperature, causing the arsenic to rise to the surface, and, being oxidized, forms a scum with oxides of lead, and is drawn off; time of operation 18 to 36 hours. When the operation is completed, *i. e.*, when the arsenic is all out of the charge, the latter is tapped into a large iron pot or kettle. Zinc is added in a solid form, the lead bullion being hot enough to melt it; after being stirred and mixed by means of iron paddles the charge is allowed to cool. The zinc, forming an alloy with the silver and gold (also taking up any little remaining copper and arsenic), rises to the top; this scum, hardening, is skimmed off and transferred to a smaller iron pot—the liquating pot. After being heated hot and liquated the top scum is taken off in small pieces, and is ready to be charged into the retorts. This scum contains a great deal of lead. A second or third zining may be required to take out all the silver in the charge, an assay being made after each zining to determine the silver remaining. Whenever the assay shows less than 5 grams of silver per ton of 1,000 kilos the charge is clean enough.

The cleaned charge (containing 0.7 to 1 per cent. zinc and antimony) is tapped in a reverberatory furnace, the refining furnace. A high heat is maintained in this furnace, and after 5 or 6 hours the zinc is all oxidized, forms a scum, and is drawn off. In the second stage, the antimony is oxidized, lead of course oxidizing to a certain extent during these operations. By means of small bars cast every once and a while, the progress can be noted and the end of the operation determined. The antimony being removed, the charge is tapped into a large iron pot, ready to be ladled and shipped to white-lead works.

Should the charge have been tapped before the antimony was entirely removed, not wishing to delay the preceding operations, the charge is "poled" in the iron pot before being ladled. Steam is introduced through a 1½-inch iron pipe, descending to the bottom of the pot. The charge is poled 10 to 60 minutes, and is then ready to be ladled. The steam pressure is just a little above that necessary to force the steam through the superincumbent lead. The use of a refining furnace instead of poling by steam, at a high temperature, as practiced in Europe, is necessitated by the large amount of antimony in the ores treated here.

The zinc scum from the first zining, containing the larger portion of the silver and all the gold of the charge, is put in jug-shaped retorts with some charcoal; the retorts are in a Faber du Four furnace. A charge of 350 pounds takes 8 to 12 hours to distill all the zinc off, which condenses in an earthen condenser placed over the mouth of the retort; coke is used for heating. The operation being concluded, the condenser is removed, the furnace tilted, and the remaining bullion poured into an iron pot,

then ladled into bars. About 60 per cent. of the zinc used is regained and reused in desilverizing. The bars of bullion are transferred to the cupel room; they contain 8 to 14 per cent. silver.

The English cupelling furnaces are used; the bars of rich bullion being fed continually until the silver blicks, the litharge running into small iron pots for removal. As soon as the silver blicks no more bars are fed, the silver is fined and tapped directly into molds, holding about 1,400 ounces of silver. These bars are assayed and shipped east, to be parted; they are about 985 to 995 fine, containing 4 to 5 thousandths gold. The drosses from the various operations in the refinery are treated in a shaft furnace, and run through the refinery again to make common lead.

MISCELLANEOUS.

The Mingo Works have four shaft furnaces and two roasting furnaces. The Morgan has one shaft and one roasting furnace. The Germania has three of the former and one of the latter. The Germania refinery has one softening furnace, two desilverizing pots, two liquating pots, two refining furnaces, two "poling" pots, one liquating furnace, six Faber du Four furnaces, three English cupelling furnaces.

Attached to the shaft furnaces in all the works are condensing chambers and flues connecting with a large chimney. The flue dust from the furnaces lodges in these, and is drawn off from time to time, and re-treated in the shaft furnaces, either undergoing a previous roasting and sintering or a cementing together with lime. This flue dust was formerly blown into the air, a dead loss. The blast required for the furnaces is furnished by either Rort's or Baker's blowers.

FUEL.

The coal used is a semi-bituminous almost lignitic coal found in Wyoming. It gives a long flame and a good heat, a fair amount of ash. The coal found in Utah is not so good. The coke employed is either English or Connellsville. It seems strange that with immense coal fields near at hand coke must be imported; but the Western coal does not make good coke, the coke being friable, not sonorous, and in small pieces. The volatile matter in the coal is very great, hence but a small percentage of coke is produced from the coal. Perhaps better apparatus than the beehive oven of Pittsburgh (which has been used for this coal) may produce better results, but it is doubtful. Lately English coke is superseding Connellsville coke. The reason is, that though the price laid down in Salt Lake City is nearly the same (in fact, even a little in favor of English coke) the English coke only contains 4 per cent. ash; Connellsville, 10 per cent. The former has only about half the wastage incidental to transportation and handling that the latter has, also being cleaner and harder. There is no reason why Connellsville coke should not be as good as the English, but the coal used must be washed and dressed before being coked. The high price of coke makes smelting costly, it being \$21 to \$25 a ton.

The charcoal used is not good, being soft and light; better charcoal can be made from piñon or nut pine, but the latter is rarely obtainable. The usual charcoal weighs 12 pounds to the bushel, the latter 14 to 17 pounds; the wastage is very large.

COST OF SMELTING.

It would seem that since fuel, labor, material, all have become cheaper within the last few years, that the cost of smelting ought to be much cheaper at present; but though absolutely somewhat cheaper (owing to better metallurgical practice), relatively it is dearer. This is owing to the deterioration of the ores, of which mention has been made before. To make the comparative cost more clear, let a charge five years ago consist of 8 parts ore and 2 parts fluxes, to-day 5 parts ore, 5 parts fluxes. To put through the furnaces these charges would require the same amount of labor, fuel, &c., but in the first case 8 parts of ore bears the cost in the latter on 5 parts. Let fuel, fluxes, and material be half again as high five years ago as now, and let 3 *a* represent cost of fuel, 3 *c* = fluxes, 3 *d* = material, 3 *b* = labor per ton of charge five years ago, then 2 *a* — 2 *b* — 2 *c* (2½) — 2 *d* would represent cost per charge to-day (2 *c* being multiplied by 2½, as 5 parts of fluxes are used now to 2 formerly). Hence, we would have the equation—

$$\frac{3a + 3b + 3c + 3d}{8} \text{ or } \frac{2a + 2b + 2c(2\frac{1}{2}) + 2d}{5}$$

Or,

$$\frac{15a + 15b + 15c + 15d}{0} \text{ or } \frac{16a + 16b + 40c + 16d}{a + b + 25c + d}$$

From this we see that though everything is cheaper to-day, the relative cost of smelting is greater, on account of the change in the ore. But longer campaigns, owing

to skillful smelting, less fuel used (saving of 20 to 30 per cent.), much smaller losses, saving of by-products, has turned the scale in favor of to-day. Smelting quartzose silver-bearing ores increases the cost; these ores are generally milling ores, but sold here on account of a better price being paid by the smelters than by millmen. The bad practice of opening the breast of the furnaces is done away with; the health of the workmen is good, lead diseases seldom occurring; formerly they were prevalent, but cleanliness and care in work are good preventives.

ORE SUPPLY.

Deep mining is becoming a necessity in most mines in this region, and until capitalists and skilled mining engineers, with practical knowledge, take charge of the mines smelting works will not be able to run to full capacity. The mines in this region have produced immense quantities of ore, and are capable of producing large amounts yet, but a different system must come into vogue than that heretofore practiced. The production of metals of Utah for 1880 has fallen off some, principally due to the decrease in production of silver-lead bullion.

PARTING GOLD AND SILVER IN CALIFORNIA.

By T. EGGLESTON, Ph. D.

In the year 1867, Mr. F. Gutzkon invented a process for parting gold and silver, which he introduced into the San Francisco Assaying and Refining Works, which is not only original but of great economic value as being at the same time one of the most expeditious and one of the least expensive methods of parting in use. Additional interest is attached to it because it was adopted, in 1875, for parting the Hartz Mountain gold and silver, and works to use it were erected at Lautenthal. A description of these works, translated from the German, is given at the close of this article.

The works in San Francisco are situated in the outskirts of the city, near the lines of railway, and within a short distance of the water, and are adapted to treat about one ton per day of the gold and silver bullion of California, Nevada, and the adjacent territory, as well as that sent from Mexico, China, and Japan. They frequently, also, part for the United States Mint, in San Francisco, when there is a press of work there.

The material comes as bricks and bars, stamped with their assay value, and as coin. This material may be silver brick containing only a little gold, as that from the Reese River district, or a large quantity of it, as that from the Comstock lode; or it may be the gold of California, with but little silver or other impurity. This gives three kinds of material to be subjected to parting:

1st. The gold bars of California.

2d. The silver bricks from the Comstock, rich in gold.

3d. Material containing a considerable percentage of copper.

The first are inquantated so as to contain two parts of gold to three of silver, and are granulated.

The second are dissolved as bricks, just as they come from the mine, without granulation; they generally contain from 2 to 10 per cent. of gold.

The third is usually the bricks which come from the tail mills and some of the mines of Nevada, and include certain classes of coins. These are melted with high-grade bars until the proportion of copper is not over 8 to 12 per cent. They are not, however, granulated.

It will thus be seen that the methods are from the outset quite different from those in Europe, where granulation of all the alloys is consid-

ered indispensable, and forms the first and the essential step in all the different varieties of processes.

The melting is done in graphite crucibles in an anthracite furnace with a forced draft. Each charge is prepared separately, and is inquartated so as to have at least three of silver to one of gold.

The metal is poured by hand from a ladle into cold water, in a very small stream, a circular motion in different planes being given to it while pouring, it being kept from .06 to .09 meters above the water. The water is contained in a large tub, and has a rapid rotary motion given to it. The metal assumes an irregular shape, more or less spherical, called granules. These are carefully dried and are then ready for solution.

The process, which is the simplest of all the parting processes, consists of eight operations:

1. The solution of the alloy.
2. Settling the solution.
3. Crystallization of the sulphate of silver.
4. Decomposition of the sulphate of silver by sulphate of iron.
5. Purifying, pressing, and melting the silver.
6. Treatment of the pot residues.
7. Treatment of the residues of the settling tanks.
8. Treatment of the sulphate of the sesquioxide of iron.

1. SOLUTION OF THE ALLOY.

The pots (Fig. R, Plate 1) in which this solution is effected are always made of cast iron. The platinum basins, which were formerly used exclusively in European works, are not used here. Cast iron will resist the action of a very concentrated acid for a long time, but as the acid is at times diluted, pots made of ordinary cast iron will not last very long. In the Vienna mint the iron used for making the pots contains from 3 to 4 per cent. of phosphorus. The iron is very white and compact, and the resistance to the action of the acid is probably due to its very close texture. Even with only 2 per cent. of phosphorus these pots have been known to last for fully two years. Silicon in large quantities produces the same effect. Dr. J. Lawrence Smith cites a ferro-silicon with 16 per cent. of silicon which was not appreciably attacked by *aqua regia*, which, if it could be cast to the requisite shape, might be used indefinitely for the solution of gold and platinum. The pots in San Francisco are .66 meter in diameter, .45 meter deep, and .02 thick. They are made with flat bottoms, and are set in brick-work, five in a row, each one having its own fireplace.

It is impossible to have the acid always of exactly the same strength, and it also varies in strength at different times in the operation, so that the pots are slightly acted upon and lose usually from 60 to 70 kilos a year in weight. They wear down in from twenty to twenty-four months to from .05 to .06 meter in thickness.

The usual charge of bullion is from 100 to 150 kilos, depending on whether it is made of granulated material or of bricks. The larger charge is for bricks. The works contain two rows or benches of these pots (Plate 1, Fig. R), each one of which has its own cover (Fig. P), and all are covered with a hood, which is open over the whole length of the bench, but is set low enough to prevent any escape of acid fumes into the works.

It would be more economical if the pots were placed six in a row, as they could be taken care of by the same number of men as now take

care of five, and if they were somewhat larger, for then more alloy could be treated by the same number of men in less time. In the conical hood (Fig. P) over each pot there is an opening (Fig. P') on the front for introducing the charge, which is protected by a cover and another on the back, from which a pipe leads to a lead-lined conduit (Fig. M) behind the furnace for condensing the escape vapors of sulphuric acid. The cover of the opening for introducing the charge slides on the outside and is moved by a wrought-iron handle cast into it. Each bench of solution pots is provided with its own condensing chamber (Fig. N), which is 4.6 meters by 4.6 meters and 11.6 meters long. It is made of sheet lead supported by a frame-work of wood. The sulphuric acid which escapes from the condensation chamber is carried into a tower, and from that it is discharged into a high chimney. The sulphuric acid is introduced into the pot as needed and is at a density of 66° B. Its depth in the pot is from 0.23 to 0.25 meter. The supply of acid comes from a tank (Fig. B) outside of the building and is regulated by a lever (Fig. H) placed immediately over the pot. Each pot has its own supply reservoir. The carboys of acid (Fig. A) are placed in the tank (Fig. B) upside down outside the building, and are left so until they empty themselves. They dip into the acid in the tank about 0.15 meter. The acid tank connects with a lead-lined reservoir (Fig. K) placed between and behind the pots by a pipe (Fig. D), so that the acid in both is at the same level. Into this reservoir a plunger (Fig. J) of wood covered with lead is fitted with a play of .03 to .04 meter on every side and is counterpoised by a weight (Fig. I). The plunger is raised and lowered by means of an iron handle on the side of the pot, which is within easy reach of the workman. When the handle is pulled down the plunger descends into the reservoir and forces an amount of acid corresponding to the volume of the plunger into the pot. When the handle is released the counterpoise raises the plunger and the reservoir is again filled with acid, that amount only which has passed into the pots escaping from the carboys in the tank. The size of the plunger is so regulated that about 10 kilograms of acid are discharged each time the plunger is entirely lowered. More or less can be discharged at any time by regulating the descent of the handle. The pot may thus be filled to any required depth with acid in a very few minutes, the acid being forced over into the pot each time the handle descends. The supply of acid is introduced generally about once in every fifteen minutes when the charge is first introduced. The first charge of acid is introduced by the fireman, who comes an hour before the refiners and lights the fire, so that by the time they arrive the acid is boiling. The refiner removes the cover from the pot, and when granules are used introduces three boxes containing from 30 to 40 kilograms of the granulated metal or a little larger weight of bars or bricks. When all the charge is made, the cover is replaced and the charge left to itself from three to four hours, depending upon the size of the granules or bricks. The acid is kept boiling during the whole operation, but care is taken not to allow it to boil so violently that any projections or spattering will take place. It is necessary to remove the cover from time to time to stir a charge of granulated metal and prevent it from packing. One refiner and one fireman do all the work connected with the pots.

2. SETTLING THE SOLUTION.

The solution in the pots is kept heated to prevent its crystallizing. When ready it is siphoned into an iron tank (Fig. U) 2.75 meters long

by 1.5 meter wide and .5 meters deep, containing sulphuric acid at 58° B., and at a temperature of 110° Cent., 0.5 cubic meter being required for every 100 kilograms of metal treated. The acid used is the mother liquor resulting from the drainage of the crystals of sulphate of silver. The siphoning is done by means of a vacuum formed by steam. The iron tanks are covered with a heavy iron lid (Fig. V), which, when necessary, is raised by a Weston pulley. To make the lid air-tight it rests on a broad India-rubber band. One end of an iron gas pipe (Fig. T) bent to the proper form is placed in the pot, and the other, fitted air-tight by means of the rubber packing, passes through the cover of the vat. Each bench of pots has its own vats. All the pots discharge in the same way. On the opposite side a steam-pipe connects in such a way that a vacuum is produced in the tank and transfers the acid from the pots to the tank. This method is much preferable to the old system of ladling and the work is done in a much shorter time. The steam used to produce the vacuum passes into the tank (Fig. j) for holding the sulphate of iron solution, to heat it, so that none of it is lost. Previous to siphoning, the gold at the bottom of the pots is pushed back to one side and the pipe is introduced near the bottom, away from the gold residue, so as to empty them as dry as possible. The tank into which the liquor discharges is filled to within .05 meter to .08 meter of the top. The acid from the pots with the silver in solution is diluted so as to bring it from 66° to 58° B., and is again covered without the use of the India-rubber band and left to settle.

The solution contains sulphate of silver, sulphate of iron and graphite from the solution pots, sulphate of copper, and, if there was any lead in the metal, some sulphate of lead, most of which with any very fine gold carried over in the bailing will be in suspension. The liquor is quite turbid from all these substances, and the object of adding the water is to clarify the liquor as the sulphate of lead becomes less soluble, and its precipitation helps to clear the liquor from any particles especially of gold in suspension. This tank is placed over a fireplace heated with wood, and is kept heated during the time that the liquor is being clarified, and subsequently discharged from this tank.

3. CRYSTALLIZATION OF THE SULPHATE OF SILVER.

When the liquor is entirely clear it is siphoned into another tank of iron (Fig. a) of the same size, but twice as deep. This tank is placed inside of a leaden one. Water flows between the two to cool down the liquor as rapidly as possible. The lead tank serves also the purpose of catching any of the sulphate of silver in case of a leak in the iron tank. The solution is clarified and siphoned into the tank about 10 a. m. By 7 p. m. the saturated solution of sulphate of silver is thoroughly cool and has crystallized. The supernatant mother liquor, now reduced to a temperature between 30° and 40° Cent., contains all the sulphate of copper. It is forced back into the first vat (Fig. U) from which the precipitate has not been removed. This is done by making the cover of the first vat hermetically tight and producing, as before, a partial vacuum with steam, on the Giffard injector principle. The acid is thus removed without difficulty and is used again as acid at 58° B., which is heated in the vat to receive the pot-liquor.

In order to effect the separation of the mother liquor so that the crystals of sulphate of silver may be as free from acid and as dry as possible, the bottom of the crystallization tank has a well (Fig. c) into which the mother liquor drains, and which also serves to bring the

siphon to the lowest point. After all the acid has been removed by the siphon, it is used as a drip, by means of a stop-cock placed in the bottom, which opens into a vessel placed beneath the vat. It is desirable, in order to facilitate the reduction of the crystals of sulphate of silver, that they should be as free from acid as possible.

The sulphate of silver is found in the bottom of the tank crystallized to a depth of about .05 meter. It is a yellow incrustation, which is more or less hard, and scattered through it there is a reddish powder of oxide of copper. It is very nearly free from acid, and if in the bottom of the tank there is any mother liquor left it must be carefully drained.

4. DECOMPOSITION OF THE SULPHATE OF SILVER BY SULPHATE OF IRON.

The crystals are now removed from the vat with an iron shovel and placed in a wooden box (Fig. c) lined with lead, 1.20 by .90 meters and .30 deep. One such box is required for every five solution pots. Between the false and the real bottom a stop-cock is placed. This vat is on a truck, and can be easily moved from one part of the works to another. After the crystals have been carefully drained a saturated solution of sulphate of protoxide of iron in water heated by steam is introduced. This solution should be made as nearly neutral as possible. It flows upon the mass from a tank (Fig. j) at a higher level and runs through the crystals, draining into the false bottom, from which it flows into a large tank 5.6 meters by 2.8 meters and .90 meters deep. The larger the tank the better. The first material dissolved is the copper, the solution of which is kept in a separate tank. This liquor contains some silver, which is recovered from it, and is blue, owing to the presence of copper. As soon as it becomes brown it is run into the regenerating tank. The green solution of sulphate of protoxide of iron dissolves out first the salts of copper, attacks the silver salt, reducing it to a metallic state, and, taking up the acid set free, becomes sulphate of sesquioxide of iron, which is brown. This operation is continued until the liquid remains permanently green, which shows that no action is taking place and that the silver is all reduced to a metallic state. The only precaution required during the operation is to turn the crystals of silver salt over from time to time in order to expose fresh surfaces to the sulphate of iron. While the liquor is running off and is quite brown nothing need be done. When it becomes slightly greenish the crystals must be stirred. When it is persistently green the operation is finished. This operation takes one man from four to five hours; 11.5 liters of the saturated solution of green vitriol are required for every kilogram of sulphate of silver treated.

The solution of sulphate of iron in passing over the crystals of sulphate of silver dissolves some of it, amounting generally to $7\frac{1}{2}$ per cent., which is regained on cooling. Both the blue and the brown liquors are caught in separate lead-lined vats, and the silver in the blue liquor separated by copper, and that in the brown precipitated by iron. The amount of silver contained in the brown solution amounts to $2\frac{1}{2}$ per cent. All the copper is afterwards regained from the blue solution. The silver which is reduced remains in the box as a more or less coherent mass of metallic silver, which has kept the shapes of the crystals of the sulphate. It amounts to 90 per cent. of the original silver charge. The reduction is very rapidly effected, the contents of the five pots being reduced in from three to four hours.

5. PURIFYING, PRESSING, AND MELTING THE SILVER.

The silver removed from the box is liable to contain some sulphate of silver. It is not desirable, on account of the quantity of liquor required to reduce it all, to continue the operation until every trace of sulphate has been reduced. It is charged into another lead-lined vat with a false bottom, which is on wheels, and is 1.22 by .90 meters and is .60 meters deep. It is intended to hold the silver from both of the decomposition vats. It is spread in layers of .025 meter thick, and over each layer a sheet of copper is laid, and so the vat is charged nearly to the top. It is then filled in the evening with hot water and left until the following morning. Any sulphate of silver which has not been acted upon by the sulphate of protoxide of iron is dissolved out and decomposed by the copper plates. In the morning the liquor is drained off and the silver transferred to a filter lined with drilling. Hot water is run through it and tested for silver. If any is found the silver in the filter is washed until every trace of sulphate is removed and the filtrate put one side for the subsequent treatment. If not, the mass in the filter is washed as long as it shows any trace of copper, iron, or acid. This takes one to two hours. When the silver is quite free from any impurities it is said to be *sweet*. It is then carefully dried and pressed in a hydraulic press into cakes 0.30 meter in diameter and 0.25 in thickness, which weigh from 15 to 20 kilograms. These cakes are dried at a high heat and then melted in graphite crucibles into bricks weighing about 40 kilograms. They are 998 fine. The silver could also be made 999 or 1,000 fine, but this is not desirable, since no allowance is made at the mint for such fine silver, because it is not wanted for commercial purposes finer than 998. It is therefore never made finer. It is generally made of whatever fineness is called for.

6. TREATMENT OF THE POT RESIDUES.

After the sulphate of silver has been all siphoned out of the solution pots, gold remains behind as a residue in a more or less finely divided state. When granulated metal has been used, it is boiled at once from one and a half to two hours with fresh acid, which is then put to one side to be used on a fresh charge of metal. When silver bricks have been treated, the gold is already 996 fine, and no second boiling is required. The gold is dipped out with a cast-iron strainer into a cast-iron pot, on wheels, containing hot acid in sufficient quantity to cover it. The residue which cannot be reached with the ladle is taken out with a hoe-shaped tool. A very small quantity is still left in the pot, which is, however, no loss, since it is recovered in the next operation. The gold is then transferred into a tank on wheels of about the same size as the tanks for washing silver, but with a vertical partition. The compartment for holding the gold has a false bottom, and comprises about three-fourths of the tank. Acid is baled upon the gold, goes through the false bottom, and is baled out on the other side. This acid is distributed in the solution pots the next day. About half a potful of acid is run through in about ten minutes. The gold is then put upon a wooden filter and hot distilled water is run through it until it is entirely sweet. As this water dissolves a very small amount of silver, it is always saved. The gold, when sweet, goes to the press, and is dried and melted into ingots like the silver. It is made 900 to 993 or even 994 fine.

7. TREATMENT OF THE RESIDUES OF THE SETTLING TANKS.

The residue in the tanks in which the silver is settled consists of the sulphates of lead and iron, the graphite separated from the solution pots, some very fine gold which has been carried over in the siphoning, and some sulphate of silver. It is allowed to accumulate for a month, at which time it will be about 0.05 meters in thickness on the bottom of the tank. When it is to be collected the mother liquor from the sulphate of silver solution is pumped up as before, heated, and drawn off as usual, but no solution from the pots is added. The residue at the bottom of the tank is then carefully washed with hot water to dissolve out any sulphate of silver, and treated with granulated zinc to reduce the sulphate of lead. It must be treated to separate the precious metals. It is then collected, dried, and fused with carbonate of soda, to remove the graphite, in a reverberatory furnace, with the slags removed from the fusion of the silver and gold, and is then cupelled.

The ashes from the fire-place of the bullion furnace are ground and washed, and what metal can be taken out in this way is separated. All the heavy material is treated in the reverberatory furnace at the same time.

The litharge from the cupellation is not reduced; the very small quantity produced is sold.

8. TREATMENT OF THE SULPHATE OF THE SESQUIOXIDE OF IRON.

The brown liquor which has passed over the sulphate of silver and been caught in a tank, as described above, when sufficiently cool, is transferred to a lead-lined vat of about the same size as that previously used, and brought to the condition of sulphate of protoxide of iron, or scrap iron. The iron precipitates both copper and silver, which fall to the bottom and form a muddy mass. The solution of sulphate, as soon as it is clear, is forced up again to the tank to be used on the sulphate of silver, and this regeneration goes on indefinitely. The mud in the bottom of the tank is collected every week and put into the sulphate of silver vat, and the sulphate of protoxide of iron run through it. The copper is first dissolved as sulphate, and so long as the liquor is blue it is kept separate, and is added to the first liquor obtained in acting on the sulphate of silver. The silver is precipitated from it with copper. The liquor which is not blue is run back to the regenerating tank with the rest of the iron liquor. As the volume of the solution of the sulphate of protoxide of iron is being constantly increased by fresh additions of water, iron, and acid, it accumulates beyond the amount required for the process. Once a week the excess of this liquor, freed from both copper and silver, is allowed to run into the sewer. The bluish liquor, rich in copper after the silver has been precipitated from it by copper, is run into another tank, and the copper precipitated with iron. The cement copper is dried and oxidized in a reverberatory furnace, dissolved in dilute sulphuric acid, crystallized, and sold. The quantity of this salt produced is very small, as it only corresponds to the copper in the bullion and the very small amount dissolved in the use of sheet-copper used to precipitate the silver.

The cement silver is collected, washed, dried, and treated as before. All the transfers of liquor are done on the injector principle. All of them except the acid are kept hot by steam; the acids are heated by fires. The number of men required to do the work are two melters, two melters' helpers, two refiners, two refiners' helpers, two reducers, one

sweetener and drier, one pressman—twelve men working eight hours a day to refine one ton of bullion, whether gold or silver. Some of these men are at times doing other work. The works can treat about \$250,000 of gold and silver together, or about 500 kilograms of gold in a day.

PARTING GOLD AND SILVER IN LAUTENTHAL.

By B. RÖSING.

[Translated by T. Egleston, Ph. D.]

It was decided several years ago to erect a special parting works for the Upper Hartz silver, which contained gold, both because the smelting of American ores at Altenau and St. Andreasberg, as well as the use of residues from the smelting processes used in the works at Olsac, in the Upper Hartz, caused the furnace products to contain a constantly increasing quantity of gold. These works were erected and commenced working in the summer of 1875.

A description of the process used, concerning which, with the exception of a short notice in the *Berg-und-Hüttenmännische Zeitung* for 1876, p. 332, no description has been given, will not be without interest.

The process consists of:

- A. The solution of the silver.
- B. The reduction of the silver sulphate.
- C. Purifying and melting of the silver.
- D. Working the sulphuric liquors.
- E. Purifying and melting the gold.
- F. Working results.

A.—SOLUTION OF THE SILVER.

Four to five centners of the silver to be treated are placed in the evening in the cast-iron pot, and twice as much of English sulphuric acid poured over it. Four centners of silver are generally used for a charge. To this six centners of sulphuric acid at 660° B. and two centners of acid which has already been used once and is somewhat weaker, taken from the lead vat (C, plate 2), is added. This addition of weaker acid lengthens the process, causes the parting pot to be acted on to a considerable extent, and makes the residues impure. The pot used for the solution is shown at A, plate 2, and in Figs. 1 and 2, plate 3.

A further description of these drawings is hardly necessary. *dd* are plates inclined to the front, which, when the pots crack, carry their contents into the vat S. The bottom of the pot, which is the part most severely attacked, is cast somewhat thicker than the sides.

In the morning the pots are heated and a decomposition represented by the following formula takes place: $2\text{Ag} + 2\text{H}_2\text{SO}_4 = \text{Ag}_2\text{SO}_4 + \text{SO}_2 + 2\text{H}_2\text{O}$.

For this reaction only 0.9 parts of sulphuric acid for one of silver, is necessary. Two parts are, however, used in order to dissolve the sulphate of silver, and thus to make the metal which has not been acted on accessible to the action of the acid.

Too much foaming of the liquid is to be avoided, and when necessary some cold acid, generally taken from C, is added to prevent it. The volatilized acid is carried off from the covered pot by a lead pipe, which fits into the opening *e* (plate 2), and is carried to the chimney, so that the particles of sulphate of silver carried off in the soot may be regained by long washing in the filter tub M, plate 3.

B.—REDUCTION OF THE SILVER SULPHATE.

When the mass is mostly dissolved, which takes from four to twelve hours with a charge of four centners, the liquid is allowed to cool, and is then dipped off from the undissolved portion with copper ladles, 18 centimeters in diameter and 10 centimeters deep. In order to settle it better into a lead vat, it is poured from this into a second vessel, B, plate 2, Fig. 1, plate 3, standing next the parting pots, and is mixed with cold water or weak solutions from the succeeding processes until it is at 60° B.

On account of the simultaneous weakening and cooling of the solution, the silver in about two hours is completely precipitated in the form of a slightly yellow cheesy mass. When the precipitation is complete, which is plainly seen, the remaining supernatant liquid, partially clear, is transferred to the lead vat C, plate 2, from which it is afterwards drawn, as has been mentioned, for the solution of the silver in the pot A. The silver deposit, freed as far as possible from acid, is carried in cylindrical copper vessels, 30 centimeters deep and 32 centimeters in diameter, into the wooden vat lined with lead, H, plate 2, Fig. 3, plate 3; water is poured over it, and iron in pieces is gradually added, but a new addition is always deferred until the

former is dissolved. The iron is used in the very suitable form of thin sheets, which have been punched out, such as the residue from the manufacture of buttons. While the silver is being separated from the sulphuric acid by the iron which forms with the acid and iron sulphate, the mass must be continually stirred with the wooden shovels (Fig. 4, plate 3). This work must be carefully done in order to prevent the formation of lumps of silver sulphate which might not be decomposed.

The reduction is finished in from two to three hours. If longer delays occur, the precipitation tank must be protected from dust, &c., by a wooden cover. As the end of the period of reduction approaches, the iron is added in smaller portions; it is then hung in the liquid instead of being thrown in, in order that no part of the metal may remain in the silver, as it would unnecessarily increase the quantity of slug in the melting. For the same purpose copper sulphate in slight excess is added towards the close of the process, as some metallic copper in the silver does little harm. This precaution is, however, not very important, as the use of the chlorine reaction allows of the recognition of any silver or silver sulphate particles, and of following the decomposition very precisely.

The tank K, plate 2, Fig. 3, plate 3, was originally used for the same purpose as H, but was shown to be unnecessary, as the work was never so pressing that a single reducing vat was not sufficient. It is therefore used to receive all the liquids containing silver and gold, as the wash water from M and T, plate 2, which, after it has settled, is transferred to H or B, in order in the reduction to furnish the water necessary for the precipitation. The silver in the settlings in K is from time to time reduced with iron and then treated like the rest of the precipitated silver.

At first the silver solution taken directly from the solution pot A was carried at once to the precipitation vat H. The large quantity of free acid which in this way came in contact with iron gives off such a large amount of hydrogen that considerable silver was carried off by it, and every workman was driven out of the works. Now, as most of the free acid is separated from the silver beforehand, this inconvenience is greatly mitigated if not entirely removed. When all the silver sulphate is decomposed, the precipitate is drawn to the highest side, *v*, of the vat H, and the iron solution, which is at 20° R., is drawn off by means of the lead siphon, Fig. 5, plate 3, whose funnel-shaped mouth is covered with linen and stands in a lead saucer, Fig. 6, plate 3, into the launder *g*, plate 2, which conducts it to the basin R, sunk in the floor of the works.

C.—PURIFYING AND MELTING THE SILVER.

The silver is cleaned from the particles of iron sulphate adhering to it in a copper filter M, plate 2, Fig. 7, plate 3. Its bottom is filled with holes and covered with a linen cloth; on top of this a vessel exactly similar to the first is placed, which, however, as it is very soon attached, was afterwards replaced by a lead vessel 4 millimeters thick with holes $1\frac{1}{2}$ centimeters in diameter. In this vessel the silver is carefully washed with water, which is heated in the iron vessel Q, plate 2, until neither litmus paper nor ferro-cyanide of potassium give any reaction with the filter water. This water flows into a lead vessel *g*, plate 2, Fig. 7, plate 3, placed below, and runs from there, so long as it is not entirely free from silver, through a lead-lined trough about 3 meters long, 16 centimeters wide, and 15 centimeters deep, into the vat K. The silver from M is placed under the hydraulic press shown at Y, plate 2. This is so arranged that the table A, plate 3, Fig. 8, with the mold in which the precipitated silver is placed, will be pressed under the piston *f*, and the water flowing from it will be conducted by a leather launder into a vessel placed underneath, where the fine particles of silver pressed out with it will settle. At the highest place in the table a hook, *h*, is made to fit under the projecting edge of the box *m*; by this means the mold and the silver cake are held in place; while the table is allowed to descend, an iron pan, *r*, is placed on it. A is again raised; the edge of *r* catches under *m*, pushes the mold up, so that the cake of silver rests on *r*, and can be removed after the second lowering of the table. The cylindrical cake of silver, which is about 12 centimeters high, is broken with a hammer and chisel, and the water, which has not been pressed out of it, is removed by heating it to a red heat in the cylindrical muffle U, which at one end is connected with a sheet-iron chimney about 1 to 8 meters high. The silver is then melted with a small addition of saltpeter to prevent sprouting during the cooling in the blast furnace V, plate 2, in a crucible holding from four to five centners, and is cast in a heated cast-iron mold, Fig. 11, plate 3, which is covered with a heated plate X, into bars of from 30 to 40 kilograms in weight. In this form the silver is sold.

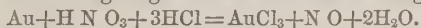
D.—WASHING OF THE SULPHURIC LIQUORS.

The liquor containing the iron sulphate with fine particles of silver is settled, both in the launder *k*, which is provided with partitions, the last one of which is filled with grains of lead, and in the basin R, plate 2, and is finally transferred from here by

means of an injector, *p*, raised into the lead steam vat D. Here the liquor is boiled, and if it contains much free acid this is saturated by iron in the form of button sheets. When the liquor is sufficiently concentrated it is placed in the wooden vat lined with lead, N N, plate 2, in which the green vitriol is crystallized on the sides. It is removed and placed on a shelf lined with lead; the mother liquor still attached to the crystals is drained through the trough *d*, and runs back into the tank K. No further use is made of the mother liquors in the vat N. Small particles of silver remain in the iron solution on their account, and also on account of the copper which is produced by the copper sulphate used to precipitate the silver, which copper sulphate is precipitated by the iron used to bring up the solution. The settlings taken from the steam pan D and the crystallization tank are collected in the receptacle, which is covered with sheet lead, and this is added as needed in the smelting of the ores.

E.—PURIFYING AND MELTING THE GOLD.

The residue insoluble in sulphuric acid is allowed to remain in the solution kettle A for several charges, four at the most, until the gold reaches the weight of from $6\frac{1}{2}$ to 7 kilograms. It is then again boiled in sulphuric acid at 63° B., in order to separate the gold from the sulphate of lead and the sulphate of silver, and from the anhydrous salts of iron and copper insoluble in concentrated acid, and is transferred after cooling in cylindrical copper vessels to the lead vat T, plate 2, Fig. 9, plate 3, during which, as in all transfers of very rich material from one vessel to another, all losses from spilling are caught on a sheet of lead laid under it. At first it was the practice to wash it two or three times with hot water taken from the boiler Q, plate 2; now steam is brought in by a pipe, O, by means of which the water covering the gold to be purified is heated, a method which answers much better. The liquor from this vat is transferred by a glass siphon into a porcelain vessel, where any gold particles carried off with it settle, and flows from here into the vat K. In order to separate any particles of metallic silver still remaining after the operation in T is finished, the gold, in a porcelain cup, is placed in the cast-iron pot P, and covered with sulphuric acid at 66° B., boiled, and then allowed to cool. This operation is repeated several times and the gold sweetened until no silver reaction takes place. The apparatus for this purpose is similar to that used for A and B, as well as the arrangement for catching the liquor in case of a crack. The volatilized acid is carried to the chimney from the opening *i*. The liquor from this purification process, as it contains gold, is carried back to the solution vessel. The gold, however, is not entirely fine, but is only 920. It is therefore treated with aqua regia in the porcelain vessel, Fig. 10, plate 3, and heated on the sand bath. The gold goes into solution according to the formula.



The liquor in which chloride of silver settles is drawn off with a glass siphon into a vessel of the form shown in *b*, Fig. 10, plate 3, is allowed to settle, and is siphoned back into *a*, so that, as in all these separations, a careful purification takes place. A solution of iron vitriol is then added in excess, which precipitates the gold.



The end of the precipitation, which is done warm, shows itself from the fact that when all the gold is reduced an excess of iron sulphate causes a considerable evolution of gas to take place from the decomposition of the nitric acid. This very decided action does not take place when the precipitation is done with iron chloride as has been attempted. The liquor and precipitate are separated by several decantations and washings with hot water, and is finished by the longest possible clarification in the porcelain vessel *c'* Fig. 13, plate 3, which was originally used for another purpose. Still further clarification might be, perhaps, advisable for this liquor. No further use is made of the iron solution.

The chloride of silver produced by the treatment of the gold with aqua regia is separated by repeated boiling with niter from the small particles of gold remaining in it, and decomposed with iron, with the addition of sulphuric acid. Metallic silver is obtained, which is smelted in a crucible and added to the original charge in the pot A. When hot water with ammonia no longer gives a reaction for iron, the gold powder is dried on the sand bath, in a large porcelain vessel about 44 centimeters in diameter, and melted in a furnace with two tuyeres, W, plate 2, in a Hessian crucible, under a cover of potash and flour, to pieces of about $1\frac{1}{2}$ kilograms. Three of these are melted together in a graphite crucible in the same furnace, and cast in bars of from 4 to 5 kilograms, in a warm iron mold, Fig. 12, plate 3, which has been smeared with oil. The broken crucibles, the slags from the silver melting, and all other rich residues are put one side in the vats *x* and *z*, and when ready are stamped, washed, fluxed, and added to the cupel. The crucibles used in melting the gold and silver are shown in Fig. 13, *a* to *e*, plate 3; *a* is the clay crucible for silver; *b* the Hessian crucible, and *c* the graphite crucible for gold. The Hessian crucible, in which only gold is melted in order to bring it into the least possible volume, is broken in order to get the cone of gold out. The others are used a number of times.

F.—WORKING DETAILS.

The figures given below, which I owe to the kindness of Bergrath Strauch, in Lautenthal, give a clear insight into the working of the Lautenthal parting process.

In the year 1876 the following quantities of silver, containing gold, were treated :

From the Lautenthal works	kilos..	994.500
Bought from the Altenau works	kilos..	5,367.000
Bought from the St. Andreasberg works	kilos..	5,121.500
Coins purchased	kilos..	.225
Total		11,483.225

The product was:

Gold in bars	kilos..	83.184
Silver in bars	kilos..	11,308.61
Iron sulphate	centners..	243

There was used:

Coke	centners..	154
Coal	centners..	496
Charcoal	cubic meters..	19
Faggots of wood	centners..	3.60
Sulphuric acid, at 66° B.	centners..	412.68
Refuse iron	centners..	70.00
Copper sulphate	centners..	4.00

There were produced per 100 kilograms of granulated silver worked :

Gold in bars	kilos..	0.72
Silver in bars	kilos..	98.48
Iron sulphate	centners..	212

There were used for this:

Coke	centners..	1.34
Coal	centners..	4.32
Charcoal	centners..	0.16
Faggots	centners..	0.04
Sulphuric acid, at 66° B.	centners..	3.60
Refuse iron	centners..	0.60
Copper sulphate	centners..	0.04

Expenses per 100 kilograms granulated silver:

	Marks.	Pfennigs.
Wages	14	729
Material	37	86
Cost	52	58
General expenses	25	32
Total	77	90

	Fine Gold.	Fine Silver.
AMOUNT OF METAL.		
In the 994.5 kilos of silver-gold from Lautenthal	<i>Kilos.</i> 26.285	<i>Kilos.</i> 979.9415
In the 5,367 kilos of silver-gold from Altenau	25.56645	5,304.303
In the 5,121.5 kilos of silver-gold from St. Andreasberg	51.99685	5,026.7725
In the 0.225 of coin	0.00035	0.169
Total	80.19215	11,311.186
PRODUCT.		
11,308.61 kilos stamped silver bars		11,282.352
83.184 kilos gold bars	83.0765	
In the residues	0.2820	23.500
Total	83.3585	11,305.852
Gain		
Loss	3.16635	5.334

The product in percentages was:

Gold	103.948
Silver	99.952

The cause of the very important gain in the product of gold is not so much the inexactness of the assays as the short method of making the calculations.

The following essay is submitted by J. Richards, consulting engineer, on machinery for crushing and pulverizing mineral stone and the application of air currents in dry crushing:

STAMPING MACHINERY.

The processes for extracting gold from mineral stone are divided into two branches—one relating to pulverizing or crushing the stone, the other to the extraction of the gold from the pulp, sand, or dust.

These processes, in so far as breaking and crushing the stone, not only for gold but for other minerals, are much the same, and for centuries past have received the attention and efforts of able engineers in all countries where mining is carried on. Taking this into account, it is a reasonable assumption that any general tendency to "types" of machinery traceable through all this history has a good foundation in the working requirements.

In California the first experiments were extremely crude, and behind what the practice of other countries afforded at the time. The first stamps used were unsuccessful; stone-breaking machines not being known at the time, laborers were employed to break the quartz with hammers.

The development of machinery was, however, rapid, and, as usual in this country, bold innovations were rapidly made, until an efficiency and economy was reached not attained elsewhere in the world.

This development has been almost exclusively by experiment and observation, not to any extent by inductive conclusions or the application of what may be called "principles," so that an impression was left, and now exists, that such improvements were all matters of accidental discovery and chance.

The result of this opinion is an annual "crop" of quartz-crushing machines, invented by all kinds of people. A tailor or a shoemaker may conceive that he is as likely to invent a new quartz-crushing process as a miner or mechanic.

Such inventions are not likely to do any good. The principles involved in the operation of stone-crushing, qualified by past history of the art, furnish data enough from which to determine the merits and advantages of different methods as they arise.

The endurance of machinery can at least be determined with a tolerable degree of certainty, and it is generally this feature that defeats the various new schemes.

The processes employed for reducing quartz are:

1. *Percussion*, by blows, represented by gravity stamps.
2. *Pressure*, represented by rollers, whether supported in axes or balanced by "opposite pressure."
3. *Masceration*, by rubbing action between surfaces.
4. *Disintegration*, by attrition between particles or rapid beaters.

These four types of machinery include all now in use, or attempted use.

From the beginning the whole tendency has been to percussive processes or stamps; and nearly all departures, perhaps all, from this method have been from a misapprehension of the nature of stamp operation in its relation to other methods. Some of the conditions may be laid down as follows:

1. In stamping machinery the strains are not imparted to the framing, or communicated to moving joints, but are absorbed by the momentum of the stamps and their stems.

2. The moving joints, bearings, and all parts subjected to abrasive wear, are removed from the quartz, and placed above it, so as to be fully protected and thoroughly accessible.

3. All surfaces subjected to wear, including shoes and dies, require no skill in replacing, are inexpensive, and not machine fitted. Shoes and dies, for example, go from the foundry to the mill, no part requiring preparation.

4. A stamp mill, consisting of a number of independent and duplicate parts, none of which are subjected to dangerous strain, there is but little risk of detention by breakage. If one battery is stopped, others go on; or if one stamp in a battery requires repairs, it is soon substituted from inexpensive parts at hand. Especial attention is called to this subdivision and duplication of parts.

5. There being no close running bearings, nor other conditions that call for special skill, stamp mills can be operated by the cheapest labor; almost any part can be safely "treated with a sledge hammer," the miners' favorite implement.

6. The machinery being, as before said, subdivided and consisting of duplicated parts, the amount of work and the consumption of power is at control. If the supply of rock is wanting, a battery can be stopped and the others go on. This is another important feature.

7. The particles of gold do not suffer from attrition or "tearing," as in other processes where a rubbing action takes place; and this tearing or masceration is a result in all machinery where the acting surfaces do not approach each other parallel.

Taking these conditions, and comparing with other processes, we will have in most cases the converse.

For example: (1) Moving or sliding joints near to or below the level of the quartz. (2) Renewable parts that require machine fitting, not to mention expensive material, such as steel or chilled surfaces, with attached parts that require fitting. (3) The machinery not subdivided, all parts depending one upon the other, so that anything broken causes detention. (4) Close running joints that move under pressure. (5) The framing or other parts having to resist the strains of the pressure applied to the quartz.

In short, the mechanical conditions point unmistakably to the results which experience has in so expensive a way brought about, and there can be no doubt in respect to the future use of percussive processes for reducing hard mineral stone. The "hammer," throughout ages, and for the whole history of mankind, has remained the leading implement, in comparison with which the lever, roller, wedge-screw, and so on, are but insignificant devices. To exert a great force throughout a limited distance (the required conditions in quartz crushing) no mechanical expedient compares to a "hammer," and the stamp mill is but a form and application of this principle.

Not taking into account the different working conditions—such as the kind of ore or the degree of fineness—a natural inference will be that the effect of stamps is as the rapidity and intensity of the blows. This assumption seems to be borne out in some stamp machines recently introduced in England, having a crank connection and air cushions, the same as the American Hotchkiss Air Hammer. The machines are indeed almost identical with the air hammers.

The high speed and intensity of the blows undoubtedly increase the efficiency of one stamp perhaps five times; but here, as in many other cases, economics may spoil this apparent gain.

For example: The same amount of investment in common stamps

would purchase five, or perhaps ten, and the aggregate effect would be as great, without involving high speed air cylinders or other perishable apparatus. Gravity is the best force, and when capacity is wanting, this can be secured to any degree by adding stamps.

In respect to crushing or preliminary breaking, we may find the same agreement between what mechanical principles point to and past experience.

Twenty or more mines in England, with several in Germany and elsewhere on the continent, employ what are called Cornish rollers for breaking; but it is believed no such plant has been erected in Europe or this country since the introduction of the American reciprocating stone breakers.

A common conclusion is that revolving rollers, acting continuously, with unlimited or extended surface, must far exceed the performance of any machinery with reciprocating motion and small surfaces. The fact is different, because, not counting first cost—which is three to one in favor of reciprocating machines—actual performance is also in favor of the latter. This will be understood when it is remembered that the coefficient of effect in such machines is as the area of the acting surfaces, and the speed at which they approach and leave each other. The mistake in respect to rollers comes from confounding their circumferential velocity with the working one; that is, with the parallel velocity at which the surfaces approach and leave each other. The acting surfaces are but a narrow line, while the whole surface of the jaws of a reciprocating machine are acting, and their speed in what may be called the working plane is greater than that of rollers; so that after all the history of the two processes is but a development of principles that from the first admitted of plain, inferential conclusions. In a considerable experience the writer has never met with a practical man who did not confound what may be called the working speed of crushing rollers with that of their perimeter.

It may be remarked here that this same principle holds good in respect to stamps; the crushing surfaces having a parallel approach, while with rotary machinery the approach is not parallel, except on an imaginary line at the center. In fact, a reciprocating stamp bears much the same relation to rotary pulverizing machines that a reciprocating breaking machine does to rollers; and the end of experiment will no doubt be but a verification of what might be learned from the history of pulverizing machinery.

The disintegrating process is a new one, comparatively, and as the action is concealed by casing, and the parts running at a high speed, there is less known of the "nature" of the operation than others more easy to investigate. Messrs. Whelper & Storer, of Boston, Thomas Carr, of England, with many others, have attempted the successful application of this principle, or mode of operating, to quartz crushing. On this coast, also, there have been very thorough experiments made, both as to economic and mechanical results; but, so far as the writer knows, all pointing to the fact that the attrition of particles, one against the other, is less than it is between the particles and the metal-driving surfaces, causing a rapid wearing away of such parts, while the agitation, so to call it, of the material, must represent a great loss of power. The history of the disintegrating process by rapidly revolving "beaters" or vanes, goes to show that it will in the end fall into its natural place in manufacturing processes—most likely the pulverization of material not silicious, or of a nature to cause much abrasion.

Such machines have now conquered a permanent and useful place not

previously supplied, but not in the treatment of hard mineral stone. Time enough has elapsed to determine this if we consider the history of the process instead of special cases.

The action on material, be it what it may, is but one of the conditions that must qualify ultimate success; a necessity for rapidly revolving journals near to and on the same plane with the material is a feature that alone might defeat, in practical use, any advantage arising from a more rapid method of pulverizing silicious material.

WET AND DRY STAMPING.

It is to be regretted that no careful experiments have been made and tabulated, to determine the effect of different kinds of stamps on the various kinds of stone, so that "constants" for performance could be fixed with some certainty.

The results in different mills have been recorded, but the conditions vary so much in the different cases that comparison is scarcely possible.

A battery of modern construction should be operated for a certain time on various kinds of ores, with different heights of drop and at various speeds. The weight should also be varied, and the screens with other details so arranged that wet and dry processes could be compared under like conditions.

A reduction of the expense is not so likely to come from machinery to crush or pulverize faster, but the attainment of conditions which will permit the machinery now in use to work up to its full capacity.

There is no doubt that mineral stone of all kinds, whether hard or soft, is more friable and may be crushed at less expense when dry, yet the product of dry stamping is, on an average, one-third less than by the wet process. This difference is not due to stamp action, which is the same in the two cases, but is the result of what may be called the "working conditions."

If some common quartz is placed in a chemist's mortar and pulverized for experiment, it will be found that up to a certain point the operation will be most rapid when the stone is dry. After this the conditions will change—pulverizing will become slow and difficult—but if water is added the effect will be increased, and the finishing process, down to the fineness required for amalgamating, will be comparatively easy.

A stamp battery is only an enlarged mortar and pestles; and all facts thus far gathered point to a similar result in experiments made in quartz mills. All will agree that stone is more easily broken to a certain degree of fineness when dry; when this point is reached the unfinished particles become enveloped in fine dust, which acts as an elastic cushion, absorbing the force of the stamps, and preventing circulation, so the coarser particles may find their way beneath the stamps.

This causes the difference between wet and dry crushing, and instead of it being a strange or unexpected result, the wonder is that the difference is so little when screens and agitation are relied upon to separate and remove the dry pulp.

I propose to apply some inductive conclusions in these ore-stamping processes, and see if by that method the difference between the wet and dry operation is not fully borne out by the working conditions.

In the previous chapter reasons have been presented why the percussive, or stamp process, is better than any other. Leaving this, therefore, in so far as mechanism for pulverizing, and treating of the conditions of stamp operation, we find certain requirement as follows:

First. The removal of particles from the stamps as soon as fine enough.

Second. The separation of such particles from the coarser ones that require further treatment.

Third. The removal of the finished pulp or sand from the battery.

Fourth. Suspension so as to permit precipitation.

So far as crushing or pulverizing, these are what may be called the "ideal conditions," which, if perfectly attained, would permit the highest possible efficiency of stamps.

Beyond the batteries there are other requirements that may, for the common gold amalgamating processes, be summarized as follows: 1. The conveyance of pulp or sand for subsequent treatment. 2. Agitation to secure exposure of particles. 3. Maintaining mobility between particles to secure exposure. These have, however, to do only with extraction, and need not be considered in connection with the present subject.

The purpose is to compare *water* in wet crushing with *air* in dry crushing, and determine as far as possible by inference how nearly the first-named conditions or requirements can be filled in the two cases.

Before entering upon such a comparison it will be necessary to offer some explanation of the proposed method of employing air in dry crushing.

Thus far, it seems, the application of air has only been in drawing off the dust from batteries; that is, removing what is held in suspension, or thrown up by agitation and caught in weak currents.

There are insuperable difficulties in constructing air ducts and nozzles so as to catch the dust near to stamps; in fact, such nozzle cannot be arranged so as to catch more than the flying dust, or what may be thrown into or near them by agitation. The strength of an induced air current in a battery is, theoretically, as the area of a plane through the battery compared to the area of the induction orifices; a difference too great for comparison, unless the volume of air passed through was so great that the expense for power and maintenance of pneumatic apparatus would more than equal any gain that could be expected in pulverizing. Fans and all kinds of pneumatic apparatus run heavily, and when moving at even a low pressure are deceptive, generally consuming several times as much power as is supposed.

One of the first requirements in employing air as a separating and conveying medium is to have the pipes and nozzles small, only large enough to carry off freely the amount of material the stamps can prepare. This is indispensable for economic reasons before named, and no attempt to employ air can ever succeed when the air current has much more volume than is required to perform the work. It is probable that in all the experiments hitherto made this principle has been lost sight of. The methods of collecting have rendered it necessary to employ large fans and great quantities of air.

The crushing area of stamps rarely exceeds 50 inches. The operation is a concentrated one in this respect, and if the dust could be gathered at the point of crushing and a strong air current forced between the shoes and dies each time the stamps are raised, such a current could be small.

To secure this end there seems to be but one way; that is, to draw the dust up through the top die or shoe by means of a central bore or duct of as small diameter as possible.

In some plans now completed for a stamp mill, with dies 10 inches in diameter, the air aperture is made 3 inches in diameter. This, it is thought, will be ample, and perhaps in excess of what is required. At any rate, a current of air thus applied directly where the crushing is

done, and drawing to the center, may be quite small in comparison with what would be required if its course and action were not so complete.

The application of any effectual means for removing the dust in dry stamping will, perhaps, lead to important changes in the construction of batteries and stamps, and that the highest effect be gained by heavier stamps falling a less distance and having a positive rotation, the latter not in a degree nor in a manner to cause extra abrasive wear. One-third of a revolution, or perhaps less, while the stamps are down, would be enough. The effect of such rotation would, of course, be dependent upon the weight of the stamps. There is no gain, or least but little, in the rotation of stamps within what may be called a crushing weight, and I strongly incline to the opinion that the rotation of ordinary stamps by the cam motion, while it serves important mechanical ends, has but little to do with their working effect.

In the case of stamps having a positive rotation, as in the "Kendall machines," there is no doubt that the removal of the "neutral axis" in the dies will improve their action, and a central bore for air would be no objection. The same may be said of the strength of dies and shoes, especially if made of molded steel. A central bore would greatly increase their strength and insure greater homogeneity, which at present is a difficulty in preparing them.

Any one acquainted with the processes of casting and annealing such pieces is aware of the uncertainty in deep sections, and that a central core is the surest way of avoiding inherent strains or unconverted metal.

Stamp stems can be of cast iron, with the heads and tappets all cast in one piece, so as to be cheaper than the present form. In the Kendall batteries, and some others, the vertical adjustment to compensate for the wear of dies is attained by shifting cams, so that fixed tappets are no objection.

These remarks upon the mechanical conditions to be met in constructing hollow stamps might be extended indefinitely, but enough has been said for the present purpose. The chipping of dies, clogging, size of bearings, and so on, can all be as well provided for as in the case of solid stems and dies.

AIR AND WATER COMPARED.

In comparing air, applied as indicated, with water as at present employed, and keeping in mind the requirements before noted, we have, first, freeing the stamps from finished particles. This function water performs in a very imperfect manner; there are no currents in one direction to permanently carry off the particles—only the "swash" of the stamps. As soon as they rise, the water flows back, carrying with it, first, the lighter and finer particles, which should be removed from the battery; and, lastly, the larger particles.

With air the fine particles would be drawn to the center as the stamps rise, and be carried off permanently, if fine enough. There would be no waiting for them to be dashed by chance against screens. The coarser and heavier ones that found their way into the air duct would fall back again at the center of the dies, leaving the coarser ones at the periphery.

The second requirement, separation of fine particles from the coarse ones in the battery, is a function still more imperfectly performed by water. Fine particles, being more readily conveyed by the water, are carried farthest and to the top, but the conditions of working permit their mixture over and over again with the unfinished ones. Separation by suspension cannot be said to take place, because such separation can

only be performed by regular currents of nearly uniform strength. In wet stamping, separation is the result of *accident*, and performed mechanically by the screens.

With air the whole operation is different; regular currents can be maintained and so modified in strength that the "selection," it may be called, would be complete. In the separation of other material, grain for example, ascent or descent of the particles is governed by the least difference in their gravity or friction.

Air currents have been employed with some success in separating or precipitating gold from pulverized quartz or placer sand. Such a process shows a power of selection far beyond what would be required in removing the finished particles from a battery.

The third requirement named was the removal of pulp or sand from batteries. In respect to water as an agent for such removal, some of the previous remarks will apply. The wash through screens is in a sense accidental, not a direct result from a sufficient cause, but an expedient, the best that seems available. To illustrate the difference between air and water as a means of removing the finished pulp or sand, let it be supposed that a battery is fed with sand fine enough to pass through the screens. If water is used the delivery will not be much faster than if stone is fed from the breakers, but with an air current through the dies the sand would all be drawn out as fast as it came between or near to the dies, and the battery cleared as rapidly as the current could carry the material.

The inference is, that this function, which water performs most imperfectly of all, would be that one most thoroughly accomplished by air.

Suspension and precipitation, named as the fourth condition, has already been explained as depending upon maintained currents. In water, when there are no direct currents, precipitation, or suspension, is the result of agitation. The limited quantity of water that can be used prevents the use of continuous currents. With air there is no such limit. Precipitation would be much the same whether air or water were employed. The mobility of particles would no doubt be greater in the case of water, unless the material was thoroughly dry in the air process, so there would be no adhesion from moisture.

In the application of air to dry crushing, *screens could be dispensed with*. On the importance of this point no remarks are required. The protection of machinery from dust would also be a result of induced air currents.

The abrasive wear of iron casings or other parts from sand passing through is easily avoided. A double air-lock could be employed, or, what would be no doubt the most simple plan, batteries could be connected by pipes with a large receiver into which the induction pipes would lead. This receiver could be made large enough to act as a temporary receptacle for sand or pulp; also to slow down the air current to any desired degree, so as to permit precipitation. By exhausting this receiver no dust or sand, except that so fine as to be held in permanent suspension, would pass through the fans.

From these premises the following conclusions are drawn:

1. The failure of water to perform, in a perfect manner, the required functions in wet crushing renders that operation much slower than it would otherwise be.

2. That mineral stone of all kinds is more friable, and can be pulverized at less expense when dry.

3. That air currents applied as before described will perform the functions required in dry crushing much more effectually than water does in wet crushing.

A CONTRIBUTION TO CALIFORNIAN GEOLOGY.

[Paper read before the California State Geological Society by Melville Attwood.]

Mr. I. Beetes Jukes, in his very useful and truly practical "Students' Manual of Geology"—which ought to be read by all engaged in mining—says, in his introduction to the subject:

"In order to reduce the great subject of geology to something like order, it appears advisable to divide it into three heads, for which we use the terms of, 1. Geognosy; 2. Palæontology; 3. The history of the formation of the series of stratified rocks."

By geognosy, I would understand, then, the study of the structure of rocks, independently of their arrangement into a chronological series, and I would divide it into two parts—lithology (stone lore) and petrology (rock lore). By lithology, I would mean the study of the internal structure, the mineralogical composition, the texture and other characters of rocks, such as could be determined in the closet by aid of hand specimens.

Under petrology, I would arrange the larger characteristics of rocks, the study of rock masses, their planes of division, their forms, their positions and mutual relations, and other characters that can only be studied in the field, but without entering on the question of the geological time of their production.

Under the head of palæontology, I should wish to give the heads of several great questions as to the laws which have governed the distribution of life, both in space and in time, as also to indicate some of the chief points in the structure of the more important extinct races and their relations to those now living.

"JOINTED STRUCTURE."

All rocks—eruptive, sedimentary, and metamorphic—are traversed by numerous planes of division termed "joints," obviously the natural result of the shrinkage or contraction of the rock masses during consolidation.

In studying the stratified rock it will be seen that, besides the planes of division, the result of succession in the acts of deposition, and which form separate strata or beds, there are other planes of division ("joints") which intersect the beds at various angles. It is not uncommon for these joints to change their angle in passing from one bed or stratum to another. Joints are mostly regular and close in proportion to the compactness of the texture of the rock; in sandstones they are uneven and often open.

In volcanic rocks the joints have been, in many cases, widened by the action of water percolating through them and dissolving a portion of the rock. Little or no attention appears to have been paid to the jointed structure of the inclosing rocks of the Comstock lode; the general direction or course the planes of jointing in Comstock rocks are nearly the same as that of the lode, and their dip and the underlay of the lode and ore bodies have a corresponding angle of inclination. A careful examination of the jointing of the rock east of the lode would enable a petrologist to distinguish the dikes from the sheet rock. The prismatic joints, like those in the basalt at the Giant's Causeway, which often resemble dry starch in their irregular and wrinkled sides, are too well known to say anything about them. The joints in granite enable

the quarryman to carry on his work with success; indeed, the whole art of quarrying consists in taking advantage of the natural divisions of the rocks by joints.

I have made a careful examination of the "jointed structure" from the Aurora Tunnel to Bodie Bluff, and found that in that section the joints, or rents, form planes of separation which are often slightly open and from a few inches to many feet apart. They traverse the rocks in straight and well-determined lines, which have definite compass bearings. They appear to be of three kinds—"vertical joints," "dip joints," and "diagonal joints." The crevice veins filling portions of these joints, or rents, are mostly of a limited extent and depth, though sometimes rich in gold.

On Bodie Bluff the croppings of many veins of this character may be seen; they are similar to what are termed "gash veins," being wedge-shaped and terminating at no inconsiderable depth. Others, however, are very different, though of the same class, like many of those met with to the south of the Standard mine, which are rich in gold, but do not appear to have any croppings, and have been discovered by cross-cutting at some depth below the surface of the ground, filling portions of the dip joints and following them down till intersected by diagonal joints, and running along the diagonal ones into other dip joints.

A similar class of auriferous veins has been met with in Australia. Mr. Daintree, F. G. S., says, in a paper which he read before the London Geological Society in 1878, on "Certain modes of occurrence of gold in Australia": "Below the zone of decomposition, however, we generally lose a class of auriferous veins which have proved very misleading to the miner, though usually very rich in gold. These usually follow the line of jointings in the rock, and are, in my opinion, simply due to the decomposition of the auriferous pyrites and of the country rock, and the redeposit of such of the decomposed material as passed into chemical solution in local fissures." The Bodie rocks are of the same class as those met with to the east of the Comstock and overlying that lode, the greater proportion of which may be called 'trachytic diorites,' in all their different stages of alteration and decomposition—diorite being employed for the old term greenstone. Mr. Rutley, in his valuable little work on "The Study of Rocks," says: "The term 'greenstone,' which, in its older signification, embraced basalt, diabase, gabbro, diorite, &c., has subsequently been restricted in its application, and employed as a synonym for diorite. Since, however, the name greenstone is almost meaningless, it seems desirable either to discard it, or, still better, to use it in its original sense as an ambiguous and comprehensive term, useful in field geology, but otherwise only admissible as an expression of comparative ignorance, such as may safely be employed in the case of rocks of a certain type, which have reached so advanced a stage of decomposition, and in which the constituent minerals are so poorly developed, that it is no longer safe or possible to hazard any opinion concerning their precise normal mineralogical constitution." The rocks collected during the sinking of the new Yellow Jacket shaft—now, I believe, some 3,000 feet deep—will, when properly determined, throw more light on the geology of the Comstock than any work that has yet been undertaken.

The difference between the Comstock lode and the lodes of Bodie—I mean those of the Bodie lodes which occupy portions of fissures which have dislocated and displaced the jointed structure—is that the country east of the Comstock lode forming the hanging wall consists entirely of acid rocks (rocks containing a large proportion of silica), while the west country's footwall rocks are what are called basic rocks—anamesite,

dolerite, and Mount Davidson diorite—all of which contain but a small percentage of silica.

The branch fissures, however, which yielded such immensely rich ore bodies, have jointed structure to the east and west of them, and are inclosed in acid rocks, so that it is comparatively easy to distinguish between them and the main lode.

The Bodie lodes, so far as I have examined them, have acid rocks for their foot and hanging walls; in fact, are inclosed in them.

The most reasonable solution for the hot water encountered in the deep workings of the Comstock is that of "expiring volcanic action," and the high temperature of the east country rocks, or those overlying the lode, I think is caused by the heated vapors rising from the main fissure through the planes of the jointed structure and numerous branch fissures, the west country rocks being comparatively cool.

Hot springs are nearly always found in the neighborhood of extinct and active volcanoes. We learn from Bunsen's experiments on the Great Geyser in Iceland that at the depth of only 74 feet, at the bottom of the tube, a column of water may be in a state of rest, and yet possess a heat of 120° centigrade, or 248° Fahr. Those who can remember the Steamboat Springs in Nevada and the geysers in Lake County twenty years ago can realize how rapidly the volcanic action is subsiding.

In M. Trurcher and Margolli's book on "Volcanoes," the Steamboat Springs are described as follows: "We have already described the intermittent springs of Iceland—the geysers. Similar springs have been discovered in California, on the eastern slope of the chain of Sierra Nevada, not far from the Lake of Washoe. The water rises in jets to a height of seven yards; the jets follow each other at intervals of five minutes, and produce a noise which resembles thunder."

The temperature of the hot water met with in the Clifford amalgamated mines, Cornwall, closely corresponds with that of the Comstock. (See report, 1864, of Prof. W. W. Smyth, chief inspector of Croron mines.) At a depth of 1,380 feet below the adit, or 1,650 feet from the surface, the water issued at a temperature of 122°. The inclosing rocks of the Wheal-Clifford lodes are clay, slate, and quartz porphyry, both of compact texture.

AURIFEROUS GRAVEL—A THEORY OF ITS FORMATION.

[Furnished by the editor of the Mining and Scientific Press.]

Many errors and false ideas have been presented to the public, and particularly to the miners, about the origin and production of the auriferous gravel deposits of California. These have often led the miner, and more particularly the prospector, astray. In other words, the miner has not received that guidance and assistance the State should have rendered him years ago.

There was a time when the Sierra Nevada was but a low mountain range, and the waves of the Pacific beat against its foothills, which probably were not extending southwest and northeast as now, but rather north-northwest and south-southeast, parallel with the main mountain range, with deep and parallel depressions between.

The drainage of the waters from the land carried with it a large amount of sediment into the valleys of the sea. The result of this sedimentary formation was the secondary or metamorphic rock. In course of time the molding, modeling, and remodeling of the face of this sec-

ondary formation became land interspersed with large dikes of trap, which was born in the sea, on lines parallel to the main mountain range. During those changes the face of the earth had been subjected at times to great convulsions; many fissures were formed in its crust, some small, and some of great magnitude, extending through the secondary and down into the primitive rocks. Minerals in solution, with siliceous predominating, formed and crystallized in those fissures till they were full. These are now known as quartz veins or lodes.

As land in places acquired an altitude above the sea-level, rivers took their inception from the rains that fell upon the land, and became extensive according to the dimensions of the land, and ran in various channels from the summit of the Sierra to the deep Sacramento and San Joaquin depressions, which were then covered by the sea. These rivers were deepened and enlarged by time, according to the elevation of the country. In the early period the land attained but a moderate altitude, which in all cases governs the depth of the river channels, so that the river beds of the ancient channels were only about from 400 to 800 feet lower than the surrounding country. By degrees, and in time, as all the different streams, with their tributaries, had formed their channels, the coast range, with all the land adjacent thereto on the east, made its appearance above the sea, and the waters receded. By the slow and gradual upheaval all the mountain streams from the Sierra Nevada and westward began to lose grade, and a diluvial deposit, formed from boulders and gravel mixed with more or less gold from the breaking down of quartz veins, began to gather along the bottom of the channels, as the stream was no longer rapid enough to carry it away, particularly so on the soft, slaty bedrock of the auriferous belts. Much of this material was the result of erosions by tributary streams, of whatever size, yet they contributed by crossing and wearing down by slow degrees the various auriferous belts, which are three in number in the central part of the State. Time and ages were passing on gradually as the coast was rising, so the inland rivers kept filling until the gravel deposit attained a depth of from 200 to 500 feet. The streams were then flat and wide, and meandering from side to side, by times, undermining the low river banks, and dropping the then growing trees into the stream, of which we now find large quantities in the form of fossil wood, mostly in the upper strata of gravel from 50 feet to 100 feet in depth. This fossil wood affords positive proof that a fine country and magnificent forest existed on the Pacific slope ages ago.

We have abundant evidence all over the central part of California of the presence of these ancient river systems which are now so conspicuous and valuable, one of which covers, to a large extent, the counties of El Dorado, Placer, Nevada, Sierra, and Yuba. These river systems cutting for ages by slow degrees down through auriferous belts of rock, which are in many places literally streaked with quartz veins, must have separated an immense amount of gold from the quartz veins in which it was formed, and carried the greater part of it into the Sacramento Valley or Basin. This theory applies equally well to other drainage basins which exist from El Dorado County and south as far as the Upper San Joaquin, and others further north emptied into the Upper Sacramento.

There is also reason to believe that during the first geological epoch of this State the formation of those rivers was greatly facilitated by glacial action. During the early part of this period one of those streams in its course westward cut through a very extensive trap-rock belt at Dutch Flat. The channel became deep and narrow compara-

tively. The river had but little gravel in it at the time, when all of a sudden a great mass of rock appears to have slid from the south bank into the stream, and we find that a great portion of this slide—millions of tons—was carried westward, down stream, three or four miles in a body, without being washed or rounded by the action of the water. I take this as evidence of glacial action.

Some time after this great slide the glacial marks disappear, and the rivers having lost most of their grade, still kept on filling up 200 or 300 feet more, with small uniform gravel, varied by little sand streaks, and the face of the country became nearly level, the streams meandering from side to side in the valleys, which were gradually being formed.

During all this time there was no lava on the west of the Sierras; but gradually a new scene appeared on the face of this slope. The earth shook and trembled by reason of internal convulsions; great fissures opened, large quantities of ashes issued therefrom, which flowed down from the volcanic Sierras into the valleys below. The streams ran so level that a large amount of ashes was deposited over the whole length and width from 100 to 200 feet in depth. After this first deposit of ashes came the heavier and more solid earthy material, generally known as lava, which issued from time to time in immense quantities from numerous volcanoes which came into existence near and above the line of the Sierras. It was doubtless the action of these volcanoes which entirely obliterated the ancient river system of the central and northern part of California. This great volcanic eruption kept on for a long period of time, flowing lava and ashes in different places and at different times, till it covered nearly the whole slope from the summit to the present valleys to a depth of from 200 to 1,000 feet. During this period there was no fixed or permanent bed for any stream. All streams were liable to be filled with lava at any time, and the running waters had to form new channels repeatedly. Eventually, when the disturbing elements became exhausted and quiet prevailed, the new and present river system began to form, and the present rivers took their inception from the natural downward tendency of the water.

From that time till now the country has changed greatly in altitude, and attained generally a much greater altitude than it formerly had, which is clearly shown by numerous faults in the bed-rock and also by the disturbances in various places of deluvial and volcanic strata of horizontal formations.

One particular proof of upheaval which exists in the Sierra Nevada I cannot refrain from pointing out. It is to be found in the form of an immense gravel or bowlder and deluvial deposit on the summit of the Sierra Nevada, three or four miles westward from Weber Lake. All this deluvium is formed from basaltic rock at an altitude of about 8,000 feet. This is proof of a large stream once flowing westward through that section of country, and draining a large portion of the interior basin in the earlier part of the modern river system. From this great and irregular upheaval we have two notable results: First, the waters running with great velocity have cut down all those mountain streams into the form of deep gorges or cañons; secondly, it has destroyed the regularity of grade in all the ancient river channels, and this result appears to be a great stumbling block in the way of tracing out those ancient streams. Nevertheless, the streams *did* run from the whole upper part of El Dorado County, northwest and through Placer and part of Nevada, and down into the valley in Yuba County, receiving many tributaries on the way, from the east, northeast, and north. Many of these streams can be found and traced where the ancient channels

have been cut through by the modern streams and cañons. And these same cutting and wearing down processes have contributed or furnished most of the gold which we find in the modern river beds, partly from the ancient gravel beds and partly from wearing down the auriferous belts of rocks and quartz veins to a depth of from 1,200 to 1,500 feet lower than the ancient streams ran. But in the early period of the modern streams they contained no auriferous deposits because they ran in lava, and, it not being gold-bearing, there was no gold mixed with the gravel in those streams till they had cut down and through the ancient river channels, which had previously become obliterated by the flow of lava. It is of the greatest importance to the prospector and miner to notice and understand this fact, because in the early gravel deposits formed from lava material he will never find gold enough to pay for extracting. But after they had cut down through the ancient gravel channels, then still deeper down through the bedrock and gold-bearing quartz veins, they became rich in gold, and hence have paid so well to work.

The following article is by H. De Groot, sr. :

HYDRAULIC MINING.

With our hydraulic miners the past has been a fairly prosperous year. Though late in getting to work, on account of the severity of the preceding winter, whereby the water was frozen up and the ditches filled with snow and ice, still the season proved, on the whole, an extremely favorable one, water being abundant and holding out until an unusually late period in the summer. Several of the larger companies might be said to have had water throughout the whole year, not having discontinued gravel washing entirely until the month of November. This only left them time enough to clean out their ditches and put their claims in good working shape before the advent of the recent winter rains, so short an interregnum of active operations having perhaps never occurred before in the history of hydraulic mining.

This branch of mining has, in fact, been improving somewhat for a number of years past, a result due to a variety of causes, such as greater experience gained by those engaged in it, to the employment of improved apparatus, increased water supply, better facilities for disposing of the tailings, &c.; no year having passed without bringing with it material gains in each of these respects. In nothing has this pursuit been so much advanced as through the constant enlarging of old and the building of new ditches, and the construction of reservoirs for storing and retaining for future use large quantities of water that before ran to waste. Through these additional aids the capabilities of this class of mines have, within the past few years, been increased fully 20 per cent.

Then, the productive capacities of many of these properties have, of late, been largely augmented through the driving of lengthy bedrock tunnels, whereby the miners have been enabled to reach and run off the deeper-lying and richer strata of gravel occupying the old river channels. As nearly all these structures have been attended with a heavy expenditure of time and money, they have severely taxed the financial resources of the companies driving them. But these companies will, in most cases, derive from these works great benefits, besides enjoying for

many years, and perhaps perpetually, a respite from further burthens of this kind. Being so highly favored as regards water supply, most of the leading hydraulic companies in California have, during the year just closed, made large clean-ups. As a consequence, dividends with the majority of them have been frequent and liberal; the profits arising from this style of mining being in most cases large, comprising generally from 50 per cent. to 70 per cent. of the gross production made. In some instances the net earnings realized, instead of being disbursed to the owners in the shape of dividends, have been expended in the purchase of additional ground, in the construction of ditches or in effecting other needed improvements.

This description of mining, though not confined to California, has in this State reached its greatest perfection and is here practiced to an extent and on a scale not elsewhere approached. The most active sites of this industry have during the year, as heretofore, continued to be in the neighborhood of Dutch Flat and Gold Run, on the San Juan ridge, about Smartsville, at and near Cherokee, Butte County, and along and in the districts adjacent to Slate Creek. While the deposits on the Forest Hill Divide, Placer County, are, in point of magnitude and richness, second to none elsewhere, the insufficient water supply restricts hydraulic mining in that locality to a comparatively narrow limit.

In Trinity, Siskiyou, and Del Norte Counties, occupying the north-westerly angle of the State, the business has been prosecuted over a large extent of territory and with a good measure of success, many of the conditions there, such as ample water supply, abundance of gravel, and immunity from the vexatious *débris* question, being extremely favorable. But the old Pliocene river channels proper, with their immensely rich bottom deposits, do not there occur, or at least have not as yet been met with, showing the affluence and strongly marked features that characterize this class of deposits in the more central mining counties of the State. Nevertheless, this northwesterly-lying region presents through the above mentioned and other natural advantages a better field than can perhaps at this time be found anywhere else for embarking capital in this particular branch of mining. Gravel-bearing lands there are comparatively cheap, while water can, as a general thing, be introduced upon them by means of short and inexpensive ditches and under almost any amount of pressure desired; nor is there often much trouble about outlet for tailings, the most of these being discharged directly into the strong currents of swift-running rivers which sweep them down stream and leave them where they can neither obstruct mining operations nor cause damage to other interests. It should be observed, however, that these advantages are to some extent counteracted by the increased cost of freights, as well as of subsistence and labor, in these remote and inaccessible sections of the State.

As regards the troublesome question of disposing of the hydraulic tailings or *débris* in localities where this material has caused or is likely to cause damage to farming lands or obstruct navigable waters, while it has not yet been fully settled, still such progress has, during the past year, been made toward that end as promises to ultimately effect its partial and perhaps full and satisfactory attainment. Both the State and the general government are now moving in this matter in a way that will, it is to be hoped, produce harmony of action among all parties concerned, if it do not fully protect every interest involved. Already litigation between the farmers and miners has been checked, with some prospect that it will be estopped altogether, as we trust it will be, see-

ing it can hardly be expected to subserve any useful end to either of the parties litigant, if persisted in.

Viewed as a whole, the condition and prospects of hydraulic mining in California may be considered tolerably good. While subject to a good many difficulties and hindrances, it is probably as free from these as most other branches of the business. Certain it is these obstacles are, through increased experience, being constantly diminished, the results reached of late years being more uniform and every way more satisfactory than during the earlier stages of this industry.

The following article is furnished by C. G. Yates:

METALLURGICAL CENTERS.

For a number of months past, there have been rumors of projects looking to the utilization of the low-grade ores of the Comstock, as well as those of numerous other metalliferous veins within a radius of 50 miles. One of the latest of these rumors is to the effect that a prominent mining man in Virginia City is causing the dismissal of hundreds of working miners, with the view of breaking up the organization of the Miners' Union in that city, as a preliminary step toward such a reduction of miners' wages as is looked upon as necessary to the profitable extraction of the millions of tons of low-grade ore said to exist in the upper levels of the various mines on the Comstock. This reduction, heretofore proposed as applicable only to the men employed in those upper levels, has been resisted by the union, from the fear that it may be only the entering wedge of a universal diminution of the wages of labor in that section. Whatever truth there may be in this and other reports, it appears highly probable that unless some reduction of expense is in some way made, the further working of the Comstock mines must soon be relegated to another generation. If this is true, the question is simply whether it is better that the large number of men now employed on and about the Comstock lode shall be compelled to seek a livelihood elsewhere, or shall continue to be employed where they now are at a lower rate of compensation. Whatever power the Miners' Union may have to prevent the employment of men at low wages, it certainly has none to enforce their being employed at a loss to those who pay.

If the present deep workings, in which the men who toil and risk their lives, undoubtedly deserve all the pay they get, do not hold forth a hope of profit to all concerned, it would certainly seem to be the part both of wisdom and humanity to stop them. On the latter score it is doubtful if they should not be stopped whether profitable or not. But so long as men can be found who are willing to sacrifice their health in order to earn a trifle more money than they could get in a rational occupation; in other words, as long as there are fools to be found, to work voluntarily in such a place, as though the digging out of a little more gold and silver was the sole object of human effort and the loftiest aim of human ambition, it is not to be expected that those who profit by the folly, without having to endure any of the hardships, will look beyond their own immediate interests. This is a matter, however, which must be settled between the parties immediately concerned.

It has long been the opinion of the writer that the natural development of our mining interests would lead to the establishment of a

system of metallurgical centers, at points favorably situated for obtaining power and material, and furnished with all the appliances known in metallurgy, for the reduction of all classes of ores on a large scale.

An indispensable corollary to such a system would be the construction of narrow-gauge railroads, by means of which the ores from a considerable region surrounding each center could be gathered in at a low cost for freight.

The advantages of such a system must be apparent to every thinking person. Not only would many costly experiments and silly projects be prevented, while many owners of mines who can now do nothing would be enabled to work their properties to the advantage of the community at large, but the sphere of usefulness of men of ability and experience in metallurgy, who are now wasting their time in superintending comparatively petty operations, would be greatly enlarged, and an increased number of mine owners would reap the benefit of a thoroughly scientific and comprehensive treatment of their ores, for the extraction of not only gold and silver, but also of lead, copper, antimony, and all other metals that could be made profitable through the agency of large capital and the best metallurgical skill.

The advantages of mixing different kinds of ores, for the different roasting and smelting processes, are well known to metallurgists, but it is impossible for operators in small and isolated works to avail themselves of these advantages.

Another great benefit which would result from the establishment of such works as are here contemplated would be that the variety and magnitude of the operations carried on would necessitate the employment of a number of assistant superintendents and overseers, who, being under competent supervision, would have the best opportunity to perfect their knowledge of practical metallurgy, while young men having merely a theoretical knowledge of the art could be received as students or workmen, and would acquire a thorough knowledge of the whole business, instead of a narrow and one-sided familiarity with one or two processes, as is now too often the case.

From events which have recently occurred in Carson City, Nev., there seems to be some probability that a movement in this direction may soon be inaugurated at that point. Should it prove so, a solution may be found of the problem of the profitable working of the low-grade ores of the Comstock.

In the consideration of metallurgical processes adapted to the conditions of this country, the various methods of leaching ores are deserving of attention. One of the principal obstacles to the introduction of these methods appears to be the very general occurrence of a certain proportion of gold in conjunction with silver in our ores, and the circumstance that no single leaching process of much practical utility, adapted to the extraction of both of the metals, is yet known. Another difficulty is that many ores are not well adapted to leaching, in the condition in which it is necessary to treat them, in the small and imperfect works to be found at the mines.

That the importance of the first obstacle has been exaggerated, and that the second may be overcome by the resources of science, when backed by a sufficient amount of capital, it will be the endeavor of the writer to show in a future article.

The presence of gold as well as silver in an ore which is to be leached by the usual method necessitates two chloridizing and two leaching operations. The silver is chloridized by roasting the powdered ore

with salt; the gold by exposing the roasted and slightly-moistened ore to the action of chlorine gas.

Leaving out of consideration that limited class of silver ores which can be successfully treated by amalgamation without roasting, we may say that roasting with salt is indispensable in extracting silver from non-smelting ores. The subsequent chlorination for gold is not so expensive as many suppose. At San Francisco prices for material, the chlorine, in the ordinary way of working, does not cost more than 80 cents per ton of ore treated. In extensive works near Carson City, purchasing material in large quantities, and with means of avoiding the waste which occurs in small works, it need not cost 50 cents per ton of ore. The item of additional labor, beyond that required for silver alone, is inconsiderable in any case, and would be inappreciable in large works. Moreover, it may safely be asserted that the extra expense of the gold extraction would be covered by the additional yield of silver consequent on the action of chlorine gas on the roasted ore. The leaching for gold takes the place of the washing, which is always necessary before roasted silver ore is leached with "hypo" for the extraction of silver, so that it cannot be considered an extra expense.

The first objection is thus disposed of, so far as concerns ores in which the gold is distinct from the silver, as is commonly the case. The presence of an alloy of the two metals presents no difficulty, if the particles are very fine; otherwise, the silver chloride, forming a crust on each particle, impedes the action of the chlorine on the gold. In the latter case recourse may be had to alternate leachings, beginning with warm brine for silver, and following that with chlorine water for gold, or by Hofmann's method of leaching with hypo for silver, partially drying the ore, and then chlorinating for gold in the usual way.

The latter process has been applied with great success to rich concentrations containing much lead, which was removed by washing the roasted ore with hot water before extracting the silver, but in a complete establishment such material would be smelted.

Leaching with warm chlorinated brine, under pressure, is one of the few known methods of simultaneously extracting gold, silver, and copper, which we do not at present insist on, because of certain difficulties in its practical application, which, however, may probably be overcome.

The most serious obstacle to the application of leaching is the want of permeability in many crushed and unwashed ores, caused by the presence of clay. This trouble can in many cases be overcome by the application of atmospheric pressure on the surface of the leaching liquid in a filtering vat, through the agency of what is called a *suction pipe*, containing a vertical column of the liquid from 6 to 20 feet deep below the vat; or, by means of a pump drawing from the vats below the filters. In other cases it is met by the method of *decantation*, which consists in agitating the ore, together with the solvent, in a large vat, allowing the ore to subside, and drawing off the clear solution of the metals. Another method by which ores, which were almost impervious to liquids by way of filtration, have been successfully leached was by allowing a small stream of the solvent to flow into the lower part and out of the upper part of a vat containing the ore, the latter being kept in suspension by gentle stirring, and the vat being so deep that only clear liquid could rise to the outlet. This method is capable of being systematized so as to be very convenient and economical, especially in regard to copper and silver.

In general, however, this class of ore would be subjected to a process of concentration, by which the slimy matter would be removed, carry-

ing with it a portion of float gold and silver chloride, &c., and would be, after subsidence in reservoirs, worked off in the smelting furnaces, or amalgamated; the heavier portions would be at once roasted and leached, or separated, by sizing and jigging, into smelting and roasting material, &c. The greater portion of the quartz or other gangue matter would thus be eliminated.

Low-grade ores of copper and silver can be economically and thoroughly treated for both metals at once by the Hunt and Douglass leaching process, the silver being precipitated in metallic state by cement copper *inclosed in porous envelopes*, on which the pure silver will *grow* in beautiful crystals, uncontaminated by mixing with the finely divided copper. The copper can in a similar manner be obtained in a state of purity by precipitation on bags containing an impure iron sponge, made at the works from ferruginous tailings of roasted and chlorinated auriferous sulphurets, or from magnetite or other rich iron ore abounding in the mountains. However, old iron in abundance could be obtained for a long time in the vicinity of Carson City.

The tailings from auriferous sulphates treated by chlorination and leaching make an excellent flux for smelting galena or quartzose ores, and any gold they may contain is recovered in the operation. A pigment for common red paint may also be made from this material by a simple process of elutriation.

The leaching processes possess important advantages over amalgamation for ores, which must in either case be roasted, as would certainly be the case with the concentrations from the low-grade Comstock ore, a material which presents none of the difficulties here pointed out. The advantages of leaching consist less in the diminished cost of the working plant, which, in a permanent establishment with abundant capital, would be a secondary consideration, than in the current cost, which is of the utmost importance. The apparatus once erected is almost indestructible by use, hence stoppages for repair or renovation are reduced to a minimum, as is also the cost of power. The cost of material for the leaching is not greater than that of quicksilver, &c., for amalgamation, and the results obtainable are better. Copper in the ore, which causes difficulty and expense in amalgamation, is in leaching a source of profit. The risk of loss through carelessness or accident is less in leaching, and with a proper arrangement of dumping-vats and a stream of water for the removal of tailings the labor of handling the ore is about the same. Even in the matter of obtaining the bullion in the form of bars from the crude products of the process, the advantage is not on the side of amalgamation, unless where very fine bullion is got, and then some considerable benefit in the matter of discount results in leaching, from the circumstance that the gold is obtained separately, while the silver can always be got at least 800 fine, and frequently much finer.

SILVER IN SEDIMENTARY ROCKS.

The following paper was read by A. W. Jackson at a recent meeting of the California Academy of Sciences, in San Francisco:

Widespread interest has recently been developed in the subject of the occurrence of silver ores in sandstones and related sedimentary rocks, by the success which has attended the development of the famous Silver Reef mines in Southern Utah. These mines ship regularly between

\$70,000 and \$80,000 worth of bullion per month, most of which is derived from ores taken from two or three strata of sandstone, a rock, which, like most sedimentary rocks, is continuous over many square miles of territory.

This certainly must seem passing strange to the Pacific coast miner, who has been accustomed to consider that if there is any place where ores of the precious metals are *not* to be sought it is in the sandstones and related sedimentary rocks.

The question is at once suggested, If precious metal is found in the sandstone of Utah, may it not be found in the sandstone of other districts? Has the prospector, who has with such untiring energy explored the most inaccessible recesses of our highest mountain chains in search of silver and gold, entirely overlooked a source of wealth which may be hidden in the monotonous sedimentary rocks of our plains and valleys? Finally, is there any practical consideration which guides the prospector which can tell him that in one locality he would seek fruitlessly for gold or silver, while in another he may hope to find it?

I think it can be shown that there is.

To the miner these are intensely practical considerations.

If argentiferous and auriferous ores are to be sought indiscriminately in all of our sedimentary rocks, then there is scarcely an acre of the surface of the dry land but must be investigated to prove either the presence or absence of ore. I am the more desirous of presenting a few thoughts on this subject for two reasons. On the one hand, prospectors have more than once recently sent sedimentary material to the geological department of the university, with a query as to whether ore deposits of the precious metals might be sought in them. On the other hand, one of the leading geologists of the country, Professor Newberry, of Columbia College, New York, has announced a theory of the formation of the silver sandstone deposits at Silver Reef which, pushed to its legitimate conclusion, would necessitate the investigation, as I said before, of almost every acre of sedimentary rock in every country before the miner could be satisfied that gold or silver did not exist in it.

Now, I am aware that geology is far from being an exact science; furthermore, that that particular portion of it which deals with the genesis of ore deposits is one of the least understood. It is truly astonishing, when one reflects, that some of the fundamental principles of an industry which yearly adds hundreds of millions of dollars to the wealth of the country should be so little understood.

However, while it is true that we know comparatively little about the genesis of ore deposits, still we are not altogether in the dark. In almost every mining district there are certain empirical laws which guide the miner in that particular district, but which are totally inapplicable, or at least not necessarily applicable, to any other district.

The laws of the occurrence of gold and silver, which are of general application, are exceedingly few.

The typical mineral vein, the "true fissure vein," as it is very properly called, is very simple in its structure and geological relations. It consists, essentially, of a fracture or fissure of a rock, varying from a fraction of an inch to many feet in width, of moderate length, rarely more than two or three miles, and of indefinite depth. This fissure becomes subsequently filled from side to side with ore and veinstone, probably introduced in the form of solutions from below. Very little obvious connection between the neighboring rocks and the contents of the fissure is observed. The bulk of the ore is confined almost entirely between the two walls of the fissure. It is often noticed, however, that the ore wan-

ders out laterally into the wall rocks in sufficient quantities to render them worth mining, and, to a much less extent than this, even to very considerable distances. This takes place, too, under circumstances where the conditions would seem to be exceedingly unfavorable, as in solid granite and similar rocks.

Special attention is called to this lateral impregnation of the country rocks, as it has an important bearing upon the genesis of the ore in the sedimentary deposits. The essential characteristics of fissure veins are, then, indefinite extension in depth, very moderate width (or thickness) and length, and subsequent formation to the inclosing rock.

The structure and geological relations of sedimentary rocks are in many respects quite the reverse of these. Take sandstone as a typical instance. It generally exists in the form of a widely extended horizontal deposit, covering many, often hundreds, of square miles, and varying in thickness from a few feet to thousands of feet. Other stratified rock often lie both above and below it, and it is always younger than the underlying and older than the overlying material.

Suppose such a body of rock to be impregnated with silver ore, more or less, throughout its whole extent; you at once comprehend the vast difference in mode of occurrence between such an ore body and the typical mineral vein previously described.

Such in general is the mode of occurrence of the ore at Silver Reef, Utah. I am indebted to Professor Newberry and to Mr. Rolker, for several years and until quite lately superintendent of the Stormont mine, for the facts concerning these mines; particularly to the latter gentleman, who has recently communicated a paper to the American Institute of Mining Engineers, upon the Leeds district mines, which was abstracted from the San Francisco Mining and Scientific Press, December 25, 1880. I have not been able to consult Mr. Rolker's original paper, but have been compelled to content myself with the above-mentioned abstract.

I will not present a detailed description of the entire district and deposit, but will suggest only such points as bear more immediately upon the question to be discussed, namely, How did the silver get into the sandstone?

Let it be remarked right here, however, that no one can pretend to furnish a complete solution of the problem in all of its details without a most minute and accurate knowledge of every detail of structure and relation presented by the deposit in place. Such a knowledge can rarely be acquired at second hand, nor can it be attained even by investigation in the field until the mines have been much more thoroughly opened than is the case at the present time. These mines have been prospected to the depth of only — feet. The Comstock lode has been pierced to a vertical depth of nearly 3,000 feet, and scientific men are to-day unable to demonstrate precisely how the ore came into its present position, and where it came from.

The temptation to hasty generalization from insufficient data is, perhaps, nowhere so great as in geology. Instances without number can be cited where theorists have fallen into error by drawing hasty conclusions from too few or imperfectly observed facts. I would prefer altogether to await the accumulation of observed facts and let them explain themselves, as they always will sooner or later, if properly recorded and collated. However, the average modern investigator in almost every department of science has found it necessary to have constantly in mind what he calls a "working hypothesis" concerning the subject under investigation, which is to him the most rational of the

many explanations of the phenomena in question which suggest themselves. Since we must have these hypotheses, it behooves us (particularly where practical considerations of great moment are involved, as in mining) to see that our hypotheses rigidly conform to observed facts, and that, as soon as this is not the case, we discard them for less objectionable ones.

It is in this spirit that we approach the present question, fully aware that at this distance from the field, and with the few data in hand, a complete solution is impossible, but believing that at least a rational choice from the two or three proposed hypotheses can be made.

To return, then, from this digression to the facts of the case.

The Silver Reef mines are situated in extreme Southern Utah. The sandstone containing the silver ore is of Triassic age, as recently determined by Professor Newberry. They are not to any extent metamorphosed from their primitive condition. There are two silver-bearing sandstone strata or "reefs," as they are called, overlying each other but separated by beds of clay shale. The ore, which above water line is mostly horn silver, and below it silver glance, is not homogeneously distributed through the entire rock, but is largely concentrated in ore-channels, lying one above another in the different beds. Organic remains of plants, partially or wholly converted into ore, are very plentiful; they make up, perhaps, the bulk of the ore, although it is distinctly stated by Mr. Rolker that he had mined portions of these beds for a stretch of 200 consecutive feet, which were absolutely devoid, to the eye, of organic remains, and yet yielded an average of \$30 per ton.

On the other hand, organic remains are plentiful in sandstone layers quite free from ore, but overlaid and underlaid by sandstone free from fossils and full of good ore. Mr. Rolker also cites another instructive instance where a layer of 2 feet of \$30 sandstone, lies upon 15 inches of barren rock, under which the sandstone again carries \$20 ore.

Further, at Silver Reef comparatively little copper is found, while farther south copper enters largely into the ore, and in the same Triassic sandstone on the west flank of the Nacimiento Mountains, in New Mexico, the silver gives place entirely to copper.

Professor Newberry finds that the extension of these sandstones into the table lands to the east of Silver Reef, and along Cedar Mountains as far north as Beaver, all contain silver, though rarely more than 7 or 8 ounces per ton.

Finally, in the words of Mr. Rolker, "the Silver Reefs are, where the silver is mostly concentrated, in close proximity to former volcanic centers; as is likewise the case at another less known locality, viz, at Virginia City, on North Creek."

These, then, are the facts which we have to interpret. How did the silver get into the sandstone?

Several theories have been propounded. Professor Newberry thinks that "the silver, like the copper, which the sandstones contain, was deposited with them, and not introduced subsequently."

Mr. Cazin, of New York, takes exception to this and thinks that "the ore deposits both of copper and silver in the Triassic sand-rocks are precipitations from solutions containing metals, upon animal and vegetable matter, such matter, and not the metallic ores, being contemporaneous with the deposition of the sandstone." This is really, however, one of the possible interpretations which can be given to Professor Newberry's statement of the case.

The usually accepted theory is that the metal solutions come from below, and are dependent upon, and immediately subsequent to, the

eruption of igneous rocks in the vicinity of the present deposits. The hot springs bringing the metal solutions are the last dying manifestations of subterranean activity.

Let us examine these theories in the order indicated.

It is unfortunate that Professor Newberry's opinion is not couched in specific language. It was probably not intended as a scientific statement, as it was contained in a personal letter to the president of the Stormont Mining Company, published in the *Engineering and Mining Journal* of October 23, 1880. It is susceptible of two or three quite different interpretations, possessing in common only the fact of contemporaneousness of deposition of the inclosing sandstones. I will give first the most natural one and the one which I think he intended, viz, that the ores were precipitated out from solution in the ocean, at the bottom of which the sandstones were formed. The only ground for this view given by Professor Newberry is his discovery of copper and silver in the same Triassic sandstones in the table lands to the east, and as far north as Beaver.

Now, on the one hand this comparatively widespread impregnation can be equally well explained by another theory, while on the other hand the theory itself seems to be unable to explain already observed facts. Conceding for the moment that the theory is the true one, there are two ways by which this precipitation could be effected, viz, by separation, caused by over-concentration of the Triassic ocean, or by reduction out of a far less concentrated solution by means of organic matter.

I find it hard to believe that Professor Newberry would have us accept the first method. It would be like asking us to believe that the Pacific Ocean, or any considerable area thereof, was made up of a concentrated solution of blue vitriol.

Mr. Rolker urges against this view that it would necessitate the existence at the present time of an homogeneous mechanical impregnation of the entire Triassic sandstone covering hundreds of square miles in Utah, New Mexico, and Colorado, while, as a fact, we find the most of the ore locally segregated, and but a small amount at distances removed from these local segregations. This objection is not a valid one, as it is quite possible for the local segregation to have been entirely subsequent to the original deposition of the ore and sandstones. One certainly could not explain upon this hypothesis, however, the peculiar form in which this local concentration is at present found, viz, in ore channels lying over each other in the two beds.

It is likewise difficult to conceive how the alternation of sandstone layers, rich in silver, poor in silver, and free from silver, as described above, could be explained upon this hypothesis. We should have to suppose the superincumbent ocean to be alternately exhausted and resupplied several times, or else, that later, the ore in the now barren sandstone was leached out and concentrated in the next lower bed. The first supposition is, to say the least, a strained one; and as for the second, there certainly appears to be no good reason why such a leaching process, if it took place at all, should favor narrow zones of but 15 inches thickness, and not be general over the entire sandstone bed.

Again, there seems to be no adequate relation between the amount of ore existing in the sandstones and the amount of copper and silver salts required to saturate an ocean to the point of deposition.

Finally, the fact that the Silver Reef region contains almost exclusively silver ores, while farther south it becomes largely replaced by copper, and again still farther to the southeast in the triassic sandstone of the Nacimiento Mountains, in New Mexico, the silver gives place en-

tirely to the copper, seems to me fatal to the hypothesis. I do not see how a subsequent separation of copper from silver over such an extensive area could be brought about.

Without denying, however, that in the progress of chemical geology the chemical possibility may be established, it must at least be acknowledged that at the present day it looks like an arbitrary assumption.

The second method of deposition above indicated, viz, reduction by organic matter out of the sea very far below the point of saturation, is an altogether more rational assumption. We are quite prepared to believe that a minute proportion of silver existed in the waters of the triassic ocean, inasmuch as it appears highly probable, although not yet directly proven, that copper and silver exist in the sea water of the present ocean in exceedingly minute quantity.

Now, while organic matter would unquestionably reduce the ore even from exceedingly dilute solution, my principal objection to this view of the question is, that in an ocean made up of such a dilute solution, there would be even far less probability that most of the copper would be reduced in one portion of the sea-bed, as at the Nacimiento Mountains, while most of the silver was deposited in a different portion of the same sea, as at Silver Reef.

Ocean currents would certainly bring about a comparatively homogeneous composition to the whole body of water, necessitating a chemically homogeneous impregnation of copper and silver over the entire triassic area; and, as I have said before, I do not see how the copper and silver could subsequently become differentiated. But again, conceding this to be possible, neither of these theories would explain why the ores in the two or three principal localities (Silver Reef and Virgin City, Utah, and on the west flank of the Nacimiento Mountains, in New Mexico) should become concentrated in the vicinity of eruptive rocks, and, so far as we yet know, there only.

Mr. Cazin advocates essentially this theory of reduction by organic matter out of an ocean containing an exceedingly small amount of copper and silver. He modifies it, however, by assuming that the deposition of the organic matter only was contemporaneous with the formation of the sandstones, which organic matter became gradually converted into ore by exposure during thousands of years to the waters of the superincumbent ocean percolating downward through the subsequently formed and forming sandstone.

The theory, even thus modified, is open, however, to all the objections above stated.

The only remaining interpretation that can be given to Professor Newberry's language (and this, in my estimation, is the most plausible of all) is that the ore particles are the result of the mechanical disintegration of pre-existing ore deposits, just as the grains of quartz in the sandstones are the result of the mechanical disintegration of pre-existing siliceous rocks, or that the ore grains thus originally formed by mechanical disintegration became subsequently oxidized into sulphates, and again reduced to sulphides by the organic matter in the sandstones.

A fatal objection to the first process (as indicated by Cazin) is that the difference in specific gravity between the ore grains and the sand grains would inevitably lead to the mechanical segregation of the ore in comparatively restricted areas. Furthermore, the ore particles are not rounded or water-worn, but have evidently been formed just where they are now found, proven also by the plant remains converted into ore, which would not bear transportation and preserve their form.

The second process, viz, oxidation to sulphate and subsequent re-

duction by organic matter, would obviate the objection that the ore particles are not rounded, but would certainly not that founded upon differences of specific gravity, although such a process would certainly admit of a far more extensive impregnation of the sandstone than the purely mechanical theory.

Further, we have the testimony of Mr. Rolker that the mountains in the immediate vicinity of these deposits have as yet revealed no ore bodies to the industrious prospector, while the nearest vein deposits, situated to the north, contain gold and lead with the silver. Rolker pertinently asks, if the ores are derived from this source, why do we not find lead or gold with the silver in the sandstones?

Finally, neither of these theories explains the occurrence of the ore in channels previously described, nor the concentration in the neighborhood of eruptive rocks.

There being, then, valid objections to all of the theories thus far suggested, let us turn to the last and most generally accepted theory, viz, that the metallic solutions came from below, and were dependent upon and immediately subsequent to the eruption of the igneous rocks in the neighborhood of the present deposit.

In the first place, let it be noted that this is substantially the theory ordinarily accepted for the formation of true fissure veins, so that if it can be made equally applicable to such deposits as these under consideration, there would be a certain amount of presumption in its favor, even if other things were equal. As fast as an hypothesis becomes gratuitous in science, it is eliminated—it becomes unnecessary. Not that nature always produces the same effects in precisely the same way. Too close adherence to this idea has frequently led into error. The only safe test is for each specific case to bring our theories to the ordeal of a satisfactory explanation of observed facts. In the present instance I fail to see a single fact which cannot be explained upon this hypothesis.

In the first place, the igneous rocks are in close proximity to every locality where ore in paying quantities has been discovered.

It explains the occurrence of the ore in chutes or ore channels, one above another, in different beds. The eruption of igneous rocks could not fail to fissure more or less the adjacent sedimentary rocks. The solutions which followed, bringing the silver and copper, would come through these fissures, and would, of course, deposit the greater portion of their metallic contents in and near the fissures which now form the ore channels. It would explain the alternation of rich and barren zones in the sandstone. We know that solutions will travel in channels offering the least resistance. The layers richest in ore will be such channels, and in proportion as the physical or chemical conditions for absorption are unfavorable, in the same proportion will the rock be poorer in ore.

It would explain the preponderance of silver in one portion of the triassic sandstone, and of copper in another portion; viz, they came through different fissures and from different sources below.

It would explain the impregnation of the sandstones even at considerable distances from the larger bodies of ore. I have already cited the common occurrence of lateral impregnation of the country rock on either side of fissure veins. In the same way from the main channels in the sandstone the lateral impregnation of the body of the rock, even to considerable distances, would take place.

Mr. Cazin objects to this theory (and considers the objection fatal)

that the ore deposits are not local, but extend over Utah, New Mexico, &c., and hence they cannot be dependent upon local fissures; and furthermore, that it is characteristic of the triassic sandstone that it is not fissured.

In reply I would say that if the ore deposits are not local neither are the igneous rocks local; and that according to Mr. Rolker the two go together; *i. e.*, the larger or more pronounced concentrations are in the neighborhood of crystalline rocks. In the second place, I am compelled on general principles to doubt Mr. Cazin's statement concerning the absence of these fissures over such an extensive district. The greater portion of the Jura-triassic area between Leeds district, Utah, and the Nacimiento Mountains, New Mexico, is deeply covered by later sedimentary rocks, exposed only in places in the deep cañons of the rivers which drain the country. Even these exposures have not all been investigated to prove either the presence or absence of silver or copper ores. One cannot speak, therefore, of an universal impregnation of the entire Triassic sandstone, nor of the absence of fissures over that whole area.

Finally, concerning the existence of fissures in those places which have been explored, neither Professor Newberry nor Mr. Cazin recognized any fissures; but Mr. Rolker has discovered the key to the whole problem when he recognized the existence of the ore channels at the Stormont mine, and properly explains them, *viz*: During the disturbances attendant upon the eruption of the neighboring igneous rocks, the sandstones were fractured without opening. Instead of producing open fissures, to be subsequently filled like ordinary fissure veins, the result was the formation of cracks, along which, from the friable nature of the sandstones, the rock would be considerably crushed, and might later partially heal up. But the ultimate result would be the existence of numerous vertical channels or water-ways, which would certainly be followed by metal solutions forcing their way upwards. These water-ways would finally contain the largest amount of ore, and would form the ore channels which Mr. Rolker describes, and from them the lateral impregnation of the sandstones, even to considerable distances, would be easily effected.

These water-ways would branch and ramify through the rock in all directions, never making themselves visible on the surface as fissure veins, and, in fact, by the entire absence of all the usual characteristics of fissure veins, such as distinct walls, selvages, &c., would easily escape the observation of even such an acute observer as Professor Newberry.

It is, then, by such a process as this that I would explain the widespread impregnation of the sandstone, so far as yet observed, and the apparent absence of fissures, as insisted upon by those who have written upon the subject.

The silver came into the sandstones, consequently, in the same general way that the silver came into the Comstock lode, or any other fissure vein, the present difference in the mode of occurrence being due to the fact that the fissures did not open, and that the sandstone absorbed the metallic solutions like a sponge, as fast as they came in contact with it. The existence of water-ways was first suggested to me by a large and magnificent specimen of ore from the Bassick mine in Colorado, now in the museum of economic geology of the University of California, presented about a year ago by Mr. J. B. Farish, then of Silver Cliff, California. The country rock of the Bassick mine is an igneous rock (sanidin trachyte), and the difference between their modes of occurrence at this mine and the Silver Reef mine is due entirely to the different nature of

the country rocks. The trachyte exists in the form of irregular fragments from the size of a walnut to many feet in diameter, all more or less rounded and greatly decomposed by the action of infiltrating metallic solutions which have deposited the ore between the fragments. Had the rock been anywhere nearly as porous as sandstone, we should have found here the same extensive lateral impregnation as at Silver Reef.

A subsequent visit to the Sulphur Bank quicksilver deposit, in Lake County, California, disclosed precisely similar relations at that mine. There augite andesite, which forms the bank, has been irregularly fissured at the time of its original solidifications, and subsequently infiltrated with metal solutions carrying mostly quicksilver ore.

I have learned recently from Prof. Joseph Le Conte that this idea of the widespread occurrence of water-ways has been suggested by him in his lectures on geology for the past two years, and that in the next edition of his geology he proposes to give it prominent place.

We are both convinced of the value of the suggestion. In fact, it is only by means of it that many otherwise puzzling deposits can be understood. It brings likewise into close genetic relation a large number of ore deposits which pass in the literature as impregnations, stocks, veins of substitution, irregular deposits, geyser deposits, &c., into genetic relation, not only with each other, but with what must be regarded as the simplest type of them all, viz, the fissure vein.

It is certainly to be expected, *a priori*, that the process of rock fracturing that accompanies every considerable disturbance in the mutual relations of rocks, for one fracture that is accompanied by the formation of an open fissure, many would be formed without opening, and through which metallic solutions could force their way upwards. The form of the resulting deposit would then depend upon the nature of the rock in which the fracture was produced.

If the fissure opened, we should have the simple fissure vein; if it remains closed and the rock was porous like sandstone, should have, as at Silver Reef, ore channels with very extensive lateral impregnation of the surrounding rock; if the rock was not porous, like the Bassick and Sulphur Bank rocks, we should have comparatively thin veinlets ramifying in all directions, accompanied, as it always is, by extensive decomposition of the rock; if the rock is very readily acted upon, chemically, by the metallic solutions, as is the case with limestone, dolomite, &c., the softer portions would be dissolved, outforming huge caverns of most irregular form, which would subsequently become partially or wholly filled with ore, as at the Eureka and Richmond Consolidated mines in Nevada.

The ore deposits at Silver Reef and at the Nacimientto Mountains are by no means the first sedimentary rocks containing sulphureted ores which have been discovered. These beds are the first that have yielded any considerable amount of silver; but copper, lead, and quicksilver, and even gold, have long been known in similar beds. I will mention but one or two localities; thus, at Vorospatak, in the Siebenburgen Mountains, the Carpathian sandstones are impregnated with gold and quartz; at Bleiberg, in Carinthia, galena is found in limestone; at Bohmisch-Brod and Schwarzkosteletz, in Bohemia, the sandstone of the Rothleigenden formation of the Germans is impregnated with copper ores. The copper schist of Mansfield, at the base of the Harz Mountains, is another instance, and many more might be mentioned.

I have studied carefully the geological relations of many such deposits, to see which of the above mentioned theories best explained the recorded facts. The theory which best explains the phenomena at Silver

Reef is, likewise, the one which appears most rational for most of the others. With but a single exception (Commern, near Aachen, in Rhenish Prussia), sedimentary rocks are impregnated only in the neighborhood of eruptive rocks. I will mention here but a single striking instance, the copper mines of Eastern Russia. Central Russia is one vast, monotonous region of comparatively undisturbed sedimentary strata, perfectly free from sulphureted ores of all kinds. But as soon as we reach the extreme eastern edge, where the igneous masses of the Ural Mountains have forced their way upwards through the sedimentary beds, there we find these same sedimentary rocks impregnated with ores of copper, while in the immediately adjacent mountains the same metal is abundantly present in the fissure veins of the eruptive rocks.

One more point, and I will close. It is the answer to the question I asked in my introduction—"Has the prospector any practical guide in his search for the precious metals?" I can only state what must still be considered as about the only law which is generally applicable to all mineral districts where the precious metals have thus far been mined, viz, that deposits of the precious metals occur almost exclusively in the neighborhood of the massive crystalline rocks.

Gold and silver may at any time be found in sandstones and similar sedimentary rocks, but only in the neighborhood of the massive crystalline rocks, and it is useless to prospect sedimentary rocks for the precious metals at great distances from such geological formations.

It is scarcely necessary to add that superficial drift deposits and all kinds of placer deposits, both recent and older, may form exceptions to the law as above stated.

TUNNELING IN CALIFORNIA.

THE ISABELLE WORKS, ALPINE COUNTY.

The cost of tunneling in this State, of course, varies very materially with the locality and with the tools used. It is not always, however, that we are able to obtain the exact figures. Through the courtesy of Mr. Lewis Chalmers, managing director of the Isabelle Gold and Silver Mining Company, limited, an English company, whose works are at Silver Mountain, Alpine County, in this State, we are enabled to publish the annual report of the company, which gives some interesting facts concerning the cost of tunneling. At this tunnel they cast their own car wheels, make their own pipes, and have facilities for storing 50,000 pounds of powder, as well as other supplies for the winter months. The report referred to is as follows:

MY LORD AND GENTLEMEN: I have the honor to transmit herewith account of our receipts and disbursement for the bygone year, showing, under different heads, the cost of every department of the work, and also the cost per foot of tunnel, which I am glad to say is, under my estimate, only \$26.16, instead of \$30. I have also the honor to present to you the following report:

For eleven months and ten days, until I had your order to stop, the work has been steadily prosecuted, and we have run 2,958 feet of 9 by 8 tunnel through hard rock. We drilled 10,283 $1\frac{1}{2}$ -inch holes, 79,485 feet, blasted 12,424 times, extracted 26,192 tons of rock, and gained by each blast (594) 4 feet 11.7 inches. To accomplish this we sharpened 5,619 drills. (For further particulars allow me to refer you to Appendix No. 1.)

Two No. 2 National Company's drills, of $3\frac{1}{2}$ -inch cylinder, driven by compressed air furnished by two of the same company's compressors (each 12-inch cylinder, $43\frac{1}{2}$ -inch stroke), at an average steam pressure of 75 pounds and air pressure 90 pounds, did the

drilling. One compressor was generally held in reserve in case of accident, although we occasionally encountered rock so hard as to necessitate the use of both.

The holes were charged with Vulcan powder, either No. 1 or 2, as the rock required, and exploded by a Ladin & Rand magneto battery, with fuses furnished by that company, both of which have given perfect satisfaction. I prefer Vulcan to any of the other high explosives.

Up to the beginning of March much time was lost, owing to the sickness of the miners, caused by the deleterious fumes arising from the explosion of the nitro-glycerine compounds used in the powder.

Since the introduction of the large Baker blower, the header has been supplied with an abundance of pure air, and we have no trouble from this cause.

To drive this blower, the lathe, drill, and circular saw used for preparing timber and track material, a 40-horse power engine was added in August; which I purchased in San Francisco, at about half its original cost, and which is now as good as new.

As the tunnel progressed the pressure of water became insufficient to force the drill cuttings from the 8-foot drill holes, but this was overcome by extending the water pipe about 1,000 feet higher up the cañon, tapping the mountain stream at an elevation sufficient to insure the requisite pressure (90 pounds per square inch).

The trestle work crossing the creek has been extended 800 feet to furnish dumping ground, with which we are now well provided.

As winter approached it became necessary to provide accommodation for 12 mules. I have therefore built a substantial stable, with grain and hay loft, with a capacity to hold six to eight months' winter feed, and which are now full.

Thirteen new cars, carrying 5,000 pounds each, have been added to the rolling stock. As we advance more will be necessary.

A commodious magazine, capable of storing 50,000 pounds of powder for winter use, has been built of brick, in the side of the mountain, at a safe but convenient distance from the works, well drained and ventilated, arched with brick and covered with Portland cement. The winter supply is laid in. From the magazine a tramway delivers the powder to the thawing house, thence to the tunnel. The thawing house is so constructed that, in cold weather, the powder can be quickly put in condition to do the greatest execution, the temperature being raised by steam conveyed by a pipe from one of the boilers.

A small building, occupied by the foreman as an office and sleeping room, has been erected near the tunnel mouth.

Finding it cheaper to buy our galvanized iron for our large air pipe in San Francisco—in consequence of the freight on made pipe being so high—and have it made at the works, I engaged a tinner, and erected for the purpose a large building close to the tunnel mouth.

The engine room has been enlarged to receive the new engine, lathe, blower, circular saw, and drilling machine before referred to.

Car wheels became an expensive item, a set being cut through by the track iron from constant work in a very short time. Toward the close of the year, therefore, I built a cupola furnace, and make my own wheels. From three runs we had 47 car wheels and 9 drill arms, at a cost not exceeding the freight on new castings from San Francisco. We recast the worn wheels and all the broken castings about the works. A complete set of compressed brass valves were also cast and turned, worth, to buy, \$50 a set, and I propose to manufacture these various parts of the drills and other machinery which are constantly wearing out, also grate bars, and, when required, shoes and dies, &c., for the mills; the only addition to the force being a molder.

At 2,750 feet from the tunnel mouth we cut through a fissure, the foot wall of which was composed of a clay slip, in which were embodied detached fragments of quartz, producing what are known as swelling ground, necessitating the frequent renewal and easing of the timbers and track, which at this point are constantly shifting their position.

At the 3,100th foot the tunnel entered another ledge, running nearly at right angles with it; the foot wall marked by a narrow stratum of quartz, assaying \$30 per ton in gold. The ledge matter extends 120 feet in width.

At the 3,950th foot we were almost inundated with water, which still continues to flow, but gives no trouble.

At the 4,300th foot we struck a ledge of quartz, clay, and sulphurets, about four feet wide, assaying from \$4 to \$5 in gold.

At 4,429 feet we entered another body of similar material, which we were still in when the work was suspended.

Up to the time of my getting the diamond drill I had no money to expend on explorations at these points by drifting, which runs away with the tunnel funds; but as core holes with the diamond drill can be run at about \$1.50 per foot, I propose to run the drill at the following points: At the 1,250th, 75 feet farther north; at the 1,700th, 200 feet south; at the 1,950th, 200 feet south; at the 3,100th, 75 feet south; at the 3,250th, 500 feet north; and at the 4,300th, 100 feet south.

At all these points there are ledge indications, but cross formations running diagonally with the tunnel impoverish and almost destroy them on the tunnel line. Cutting through these cross malformations, I expect to find them, or some of them, free, and, therefore, ore-producing.

To prove this theory, I directed the ground to be opened on top at the 1,250th foot by two pits sunk on the line of the supposed lode north from the destroying porphyry, one pit at 500 feet, and another at 600 feet distant from said porphyry, and in each pit found vein matter, making the presence of a ledge beyond dispute.

In 1879 a drift was started at the 1,250th, to cut through this porphyry and run 200 feet at right angles to the tunnel. When the diamond drill arrived it was started at the face of this drift, and when work was suspended it was penetrating the ledge.

None of the ledges I have mentioned are the Silver Mountain, the vertical of which, from a recent close personal survey and examination of the ground, will not, I think, be reached under 5,320 feet; and, assuming the dip to be west or away from the tunnel mouth (as, contrary to my expectations, it has been in all the ledge formations we have cut), we may not reach the ledge itself till we get to the 3,700th. Here, also, we shall have to drift through another destroying formation, which, though it may not cut off entirely, will, in all probability, greatly impoverish it at this point. This drift may have to run 600 feet, at a cost of \$6 a foot, which will be amply repaid on reaching the ledge where free; but we may strike it free for a short distance after running only 200 feet.

This ledge is about 150 feet in width, and carries its ore on both hanging and foot walls, with a break or horse in the center about 60 feet wide—a fact which is characteristic of this group of fissures.

About 150 feet from the hanging wall we may expect to find the Sandy Gulch, and from that to the 7,200th the lodes of the company cover the ground. Of these the Adolphus and Pine Tree are the most important. The vertical of the I X L passes through the tunnel near 7,680, and of the Exchequer at 8,000 to 8,200, although, because few of the ledges through which the tunnel passes carry their outcrops to the surface on the tunnel line, it is no easy matter to fix those points with certainty. Had it not been necessary to lay off the line between two fixed points, so as to meet the requirements of the three companies, the tunnel could have been carried so much farther south as to run under the Isabelle ledge, where they do crop up on the surface; but so laid off the tunnel would have been much longer.

That you will find in all of these lodes, where free or undisturbed by more recent worthless formations, rich bonanzas I have not the remotest doubt, and I say so with the utmost confidence when I call to mind that with my own hand I have taken ore from the Pine Tree assaying from \$30.96 to \$69.70 per ton; from the Adolphus, specimens worth \$95.46 per ton; from the Exchequer, \$4,000 to \$5,000 per ton, and that from the I X L croppings over \$100,000 were milled in the old Pittsburgh and Davidson Mills. It was from a spot only, comparatively speaking, that the millions of dollars were produced that rewarded the perseverance of the fortunate owners of the bonanza mines on the Comstock. Here you have so many lodes, and so well defined on the top as well as where they have been opened at depth, and therefore so many chances; your tunnel secures to you the mining and milling of your ores at so cheap a rate that success, I humbly submit, is placed beyond a peradventure.

I have the honor to remain, my lord and gentlemen, your most obedient servant,
LEWIS CHALMERS,
Managing Director.

SILVER MOUNTAIN, CAL., *January 22, 1881*

INDEX OF MINES.

A.

	Page.
Aber, Fresno County, California	34
Addenda, Mono County, California	43
Addie Leonard, Owyhee County, Idaho	125
Adelaide, Calaveras County, California	22
Adelaide, Lake County, Colorado	137
Adelphi, Eureka County, Nevada	96
Admission, Calaveras County, California	21
Advance, Alpine County, California	11
Ah You, Sierra County, California	80
Ajax, San Bernardino County, California	33
Alabama, Placer County, California	66
Alabama, San Bernardino County, California	32
Alaska, Nevada County, California	54
Alaska, Sierra County, California	81
Allegheny, Eureka County, Nevada	96
Alexander, Nye County, Nevada	99, 108
Alexandria, Eureka County, Nevada	96
Alice, Deer Lodge County, Montana	126, 131
Allen, Davidson County, North Carolina	169
Al Henry, Calaveras County, California	22
Allison, Owyhee County, Idaho	125
Alpha Hydraulic, Nevada County, California	62
Alpine, El Dorado County, California	27
Alpine, Utah County, Utah	128
Alta, Storey County, Nevada	101, 105, 230, 237
Amador and Sacramento Canal Co., Sacramento County, California	32
Amador King, Amador County, California	12
Amelia, Calaveras County, California	24
American, Boulder County, Colorado	147
American, Lake County, Colorado	137, 140
American Eagle, Gunnison County, Colorado	149
American Girl, Gunnison County, Colorado	150
American Hydraulic, Sierra County, California	77
American Union, Inyo County, California	29
Amie, Lake County, Colorado	140, 141, 143, 158, 235
Amiens, Lawrence County, Dakota	161
Amoskeag, Butte County, California	16
Anderson, El Dorado County, California	28
Anderson, Sacramento County, California	32
Annie, Utah County, Utah	129
Annie Allen, Humboldt County, Nevada	97
Antelope, Plumas County, California	69
Anthrums, Kern County, California	31
Apex, Shasta County, California	74
Arab, Gunnison County, Colorado	150
Arcadian, Plumas County, California	69
Argenta, Elko County, Nevada	92, 108, 235
Argentine, Lake County, Colorado	143
Argonaut, Inyo County, California	29
Arizona Silver, Humboldt County, Nevada	97
Arnot Reed, Yuba County, California	88
Arnott, Sierra County, California	80
Arrighi, Gilpin County, Colorado	144
Ashcroft, Boise County, Idaho	123
Atlantic, Gunnison County, Colorado	151

	Page.
Atlantic-Pacific, Plumas County, California	69
Atwood, Sierra County, California	81
Auburn, Placer County, California	65
Aurora, Lumpkin County, Georgia	178
Austin, Utah County, Utah	129

B.

Bachelor, Lemhi County, Idaho	124
Badger, Lemhi County, Idaho	124
Bainbridge, Los Angeles County, California	31
Baird, Sierra County, California	80
Baisley, Baker County, Oregon	118
Baker, Baker County, Oregon	118
Bald Eagle, Gunnison County, Colorado	149
Bald Mountain, Sierra County, California	80
Bald Mountain Consolidated, Sierra County, California	77
Ballarat, Nevada County, California	60
Baltimore, Placer County, California	64
Bandin, Calaveras County, California	21
Banner, Butte County, California	15
Banner, Eureka County, Nevada	96
Banner, Lemhi County, Idaho	124
Banner, Nevada County, California	55
Bannock, Owyhee County, Idaho	125
Barcelona, Nye County, Nevada	100
Barker, Placer County, California	63
Bart, Lumpkin County, Georgia	178
Bassick, Custer County, Colorado	147, 235
Baxter, Clear Creek County, Colorado	146
Baxter, Yuba County, California	89
Bayfield, Humboldt County, Nevada	97
Bay State, Eureka County, Nevada	94
Bay State, Lincoln County, Nevada	99
Bazzina, Boise County, Idaho	123
Beagle, Union County, Oregon	120
Beattie, El Dorado County, California	27
Beaver Dam, Montgomery County, North Carolina	174
Bechtel Consolidated, Mono County, California	41, 90, 237
Beehive, Butte County, California	18
Beeswax, Gunnison County, Colorado	150
Belcher, Storey County, Nevada	101, 104, 105, 235
Belding, Esmeralda County, Nevada	92
Bell, Lumpkin County, Georgia	179
Bell, Plumas County, California	71
Belle, Gunnison County, Colorado	151
Belle Isle, Elko County, Nevada	92, 235
Bellerophon, Utah County, Utah	128
Belmont, Nye County, Nevada	100
Belvidere, Mono County, California	41, 90
Bendarita, Mariposa County, California	36
Ben Franklin, Custer County, Colorado	148
Benton, Storey County, Nevada	101, 105
Berrell, Mariposa County, California	38
Betty O'Neill, Lauder County, Nevada	98, 108
Big Bar, Humboldt County, California	35
Big Bear, Butte County, California	18
Big Blue, Clear Creek County, Colorado	146
Big Croppings, Boise County, Idaho	123
Big Cross, Gunnison County, Colorado	149
Big Flat, Napa County, California	36
Biggs, Tulare County, California	83
Big Gun, Placer County, California	64
Big Spring, Placer County, California	64
Billings and Eiler, Lake County, Colorado	137
Black, Nevada County, California	62
Black Bear, Siskiyou County, California	82, 90, 228
Black Hawk, Humboldt County, California	35
Black Jack, Owyhee County, Idaho	125

	Page.
Black Jack, Sierra County, California	80
Black Prince, Humboldt County, Nevada	97
Black Prince, Lake County, Colorado	142
Black Tiger, Chaffee County, Colorado	153
Blakely Hydraulic, El Dorado County, California	28
Bletcher Consolidated, Tuolumne County, California	85
Blieftrien, El Dorado County, California	28
Blooming Ditch Gravel, Butte County, California	17
Blue Banks Hydraulic, Nevada County, California	62
Blue Bird, Gunnison County, Colorado	150
Blue Bluff, Placer County, California	66
Blue Gravel, Sierra County, California	81
Blue Lead, Sierra County, California	76
Blue Light, Los Angeles County, California	31
Blue Ridge, Gunnison County, Colorado	150
Bobtail, Gilpin County, Colorado	144, 158, 235
Bodie Consolidated, Mono County, California	39, 90, 228, 235
Bonanza, Calaveras County, California	19
Bonanza, Elko County, Nevada	92
Bonanza, Sierra County, California	78
Bonanza, Tuolumne County, California	84
Bon Homme, Gunnison County, Colorado	149
Booker, Mono County, California	44
Booth Gravel, Shasta County, California	75
Borego Broncho, Inyo County, California	31
Borussia, Utah County, Utah	128
Boss, Tuolumne County, California	85
Boston, Nevada County, California	62
Boston Consolidated, Mono County, California	42, 237
Bostwick, Gilpin County, Colorado	144
Boulder Creek, Siskiyou County, California	82
Boulder Hill, Alturas County, Idaho	123
Branch Mint, Inyo County, California	28
Brandy City Hydraulic, Sierra County, California	80
Brave, Placer County, California	65
Breece, Lake County, Colorado	140
Bredemyer, Utah County, Utah	128
Brewer, Chesterfield County, South Carolina	176
Bridge's Creek, Yuba County, California	89
Briggs, Gilpin County, Colorado	144
Brighton, Chaffee County, Colorado	153
Briskey or Lake, Mono County, California	49
Briskey Ledge, Mariposa County, California	37
Bristol, Humboldt County, California	35
Bristol, Lincoln County, Nevada	98
Bristow, Calaveras County, California	22
Brittenstein, Chaffee County, Colorado	153
Broderick, Nevada County, California	60
Brooklyn, Nye County, Nevada	99
Brooklyn Girl, Gunnison County, Colorado	150
Brown and McSorley, Calaveras County, California	24
Brown Bear, Trinity County, California	87
Brown Bear, Shasta County, California	74
Bruckman, Sierra County, California	78
Brush Creek, Yuba County, California	88
Brush Hill, Lassen County, California	34
Bryant, El Dorado County, California	28
Buck Creek, Plumas County, California	71
Buckeye, Calaveras County, California	24
Buckeye, Sierra County, California	81
Buckeye Hydraulic, Trinity County, California	87
Bueno Vista, Inyo County, California	29
Buffalo and Idaho, Alturas County, Idaho	123
Buffalo Hunter, Custer County, Colorado	147
Bull Domingo, Custer County, Colorado	147, 158, 237
Bullion, Alturas County, Idaho	123
Bullion, Humboldt County, Nevada	97
Bullion, Rowan County, North Carolina	169
Bullion King, Gunnison County, Colorado	150

	Page.
Bullion, Storey County, Nevada	101, 105, 237
Bullion, Utah County, Utah	128
Bully Bully, Calaveras County, California	21
Bullwhacker, Boise County, Idaho	123
Bulwer Consolidated, Mono County, California	40, 90, 237
Bunker Hill, Amador County, California	12
Bunker Hill, Lander County, Nevada	98
Bunker Hill, Napa County, California	36
Bunker Hill, Nevada County, California	59
Bunker Hill, Sierra County, California	80
Burgess, El Dorado County, California	28
Burlington, Gunnison County, Colorado	150
Burlington, Montana	126
Bushman, Plumas County, California	74
Butte, Butte County, California	16

C.

Cable, San Diego County, California	34
Caledonia, Lawrence County, Dakota	161, 163, 167, 237
California, Alaska	168
California, Eureka County, Nevada	96
California, Gilpin County, Colorado	145
California, Lake County, Colorado	137
California, Sierra County, California	78
California, Storey County, Nevada	101, 104, 105, 108, 235
California Water and Mining, El Dorado County, California	25
Cameron, Siskiyou County, California	82
Camutea Hill, Amador County, California	14
Candelaria No. 2, Esmeralda County, Nevada	92
Carbonate Hill, Lake County, Colorado	141, 143
Caribou, Boulder County, Colorado	147, 158, 235
Carrigan and Fitzpatrick, Sacramento County, California	32
Caroline, White Pine County, Nevada	106
Cashier, Gilpin County, Colorado	144
Catalpa, Lake County, Colorado	140, 143
Cedar Creek, Placer County, California	63
Centennial, Esmeralda County, Nevada	93
Centennial, Montana	126
Centennial, Nevada County, California	54
Centennial, Shasta County, California	74
Centerville, Butte County, California	17
Central, El Dorado County, California	26
Central, Shasta County, California	74
Central Hill, Eureka County, Nevada	94
Champion, Calaveras County, California	23
Champion, Inyo County, California	31
Champion, Lawrence County, Dakota	162
Champion, Mono County, California	43
Champion, Pinal County, California	112
Chaparral, El Dorado County, California	25
Chaparral, Sierra County, California	80
Charter Oak, Pennington County, Dakota	160
Chay Kee, Calaveras County, California	24
Cherokee, Plumas County, California	68, 237
Cherokee Flat, Butte County, California	14
Chester, Nevada County, California	59
Chicago, Calaveras County, California	21
Chicago, Nye County, Nevada	100
Chicago, Placer County, California	66
Chicago, Shasta County, California	75
Chicago, Utah	127
Chicago and Georgia, Lumpkin County, Georgia	178
China, Nevada County, California	55
China Flat, Humboldt County, California	35
Chloride, Esmeralda County, Nevada	92
Chloride, Gunnison County, Colorado	150
Cholar Potosi, Storey County, Nevada	101, 105

	Page.
Chrysolite, Lake County, Colorado.....	140, 142, 143, 158, 235
Chrysopholis, Inyo County, California.....	30
Church Hill, Shasta County, California.....	75
Cisco Consolidated, Placer County, California.....	66
Clara Fisher, Gunnison County, Colorado.....	150
Clark and Coffee, Butte County, California.....	16
Classic Hill, Napa County, California.....	36
Cleveland, Lumpkin County, Georgia.....	178
Cleveland and Turin, Sierra County, California.....	80
Climax, Lake County, Colorado.....	140, 141, 143, 235
Clipper, Montana.....	126
Clyde, Gunnison County, Colorado.....	149
Cold Spring, Boulder County, Colorado.....	147
Cold Spring, Nevada County, California.....	55
Cold Stream, Clear Creek County, Colorado.....	146
Collins and Corcoran, Boise County, Idaho.....	123
Cologne, Utah County, Utah.....	128
Colo Gravel, El Dorado County, California.....	28
Colorado Hill, Nevada County, California.....	60
Colorado No. 2, Alpine County, California.....	11
Colorado and Montana, Montana.....	126
Colorado Prince, Lake County, Colorado.....	142, 143
Colorado United, Clear Creek County, Colorado.....	146
Columbia, Humboldt County, Nevada.....	97
Columbia Consolidated, Elko County, Nevada.....	92, 108, 237
Columbus, Chaffee County, Colorado.....	153
Comet, Clear Creek County, Colorado.....	146
Comet, Utah County, Utah.....	128
Commissary, Esmeralda County, Nevada.....	93
Compromise, Mariposa County, California.....	36
Comstock, Lake County, Colorado.....	143
Confidence, Calaveras County, California.....	21
Confidence, Tuolumne County, California.....	86
Conley & Gowell, Plumas County, California.....	72
Connell, El Dorado County, California.....	28
Connolly, Eureka County, Nevada.....	94, 96
Conover, Butte County, California.....	18
Conrad, Placer County, California.....	65
Conrad Hill, Guilford County, North Carolina.....	169
Consolidated Amador, Amador County, California.....	12
Consolidated Imperial, Storey County, Nevada.....	104, 105, 237
Consolidated Kansas, Gilpin County, Colorado.....	144
Consolidated Pacific, Mono County, California.....	42, 237
Consolidated Pay Rock, Clear Creek County, Colorado.....	146
Consolidated Virginia, Storey County, Nevada.....	101, 102, 104, 105, 108, 235
Consolidated Wyoming, Nevada County, California.....	62
Constance, Boise County, Idaho.....	123
Constitution, Nevada County, California.....	56
Contention, Pima County, Arizona.....	114, 117
Continental, Lemhi County, Idaho.....	124
Continental, Tuolumne County, California.....	84
Copper Queen, Pima County, Arizona.....	113
Corinth, Nevada County, California.....	62
Corless, Eureka County, Nevada.....	96
Coso, Inyo County, California.....	31, 90
Cranage, Placer County, California.....	64
Cranberry, Mariposa County, California.....	36
Crater, Placer County, California.....	66
Craycrofts, Sierra County, California.....	79
Crescent, Plumas County, California.....	67
Crescent and Etna, Lake County, Colorado.....	143
Cross, Custer County, Dakota.....	160
Crown Point, Storey County, Nevada.....	101, 104, 105, 235
Crystal, Gunnison County, Colorado.....	150, 151
Culver and Co., Sierra County, California.....	79
Cumberland, El Dorado County, California.....	26
Cummings and Finn, Lake County, Colorado.....	137

D.

	Page.
Dahlonega, Lumpkin County, Georgia.....	178, 237
Daly Creek, Lemhi County, Idaho.....	124
Danae, Lumpkin County, Georgia.....	178
Dan McKay, Amador County, California.....	12
Dardanelles, Placer County, California.....	64, 90
Davis, Montana.....	126
Davis and Wilson, Sierra County, California.....	79
Day, Lincoln County, Nevada.....	99, 108
Dead Beat, Kern County, California.....	31
Deadwood, Lawrence County, Dakota.....	161, 163, 167
Deadwood, Nevada County, California.....	55
Deadwood, Placer County, California.....	64
Deadwood, Plumas County, California.....	70
Deadwood Terra, Lawrence County, Dakota.....	165, 167, 235
Decatur, Owyhee County, Idaho.....	125
Deckar, Placer County, California.....	65
Deep Blue Gravel, Calaveras County, California.....	22
Defiance, Lander County, Nevada.....	98
Defiance, White Pine County, Nevada.....	106
Delaney, Butte County, California.....	17
Delaware No. 2, Eureka County, Nevada.....	96
Del Monte, Custer County, Colorado.....	148
Denier, Trinity County, California.....	87
Derbec Blue Gravel, Nevada County, California.....	60
Desert Chief, San Bernardino County, California.....	32
De Soto, Humboldt County, Nevada.....	97
Dexter, Montana.....	126
Dexter, San Bernardino County, California.....	33
Diadem, Plumas County, California.....	71
Diamond, Placer County, California.....	63
Diamond Creek, Placer County, California.....	66
Diana, Mono County, California.....	47
Dickover, Custer County, Dakota.....	160
Dickson and Co., Lake County, Colorado.....	137
Dictarhoff, El Dorado County, California.....	24
Dick Turpin, Mono County, California.....	49
Dillon, Nevada County, California.....	54
Diquita, Gunnison County, Colorado.....	150
Dives, Clear Creek County, Colorado.....	146
Dix and Cooper, Shasta County, California.....	75
Dodson, Butte County, California.....	18
Dolly Varden, El Dorado County, California.....	26
Dolly Varden, Park County, Colorado.....	148
Donns, Amador County, California.....	12
Donovan, Sacramento County, California.....	32
Dorn, Abbeville County, South Carolina.....	177
Double Branch, Polk County, North Carolina.....	175
Double Standard, Tulare County, California.....	83
Dry Creek, Shasta County, California.....	75
Dry Cup, Shasta County, California.....	76
Dudley, Mono County, California.....	42, 90
Duffie, Gaston County, North Carolina.....	171
Dug Out, Eureka County, Nevada.....	94, 96
Duuderberg, Clear Creek County, Colorado.....	146, 237
Duuderberg, Eureka County, Nevada.....	96
Dunkin, Lake County, Colorado.....	140, 142, 143, 158, 235
Dunkirk, Clear Creek County, Colorado.....	146
Dunlop Blue Light, Los Angeles County, California.....	31
Dunn, Mecklenburg County, North Carolina.....	170
Dunn Mountain, Rowan County, North Carolina.....	169
Durango, Gunnison County, Colorado.....	150, 237
Durant, Gunnison County, Colorado.....	150
Duryea, Calaveras County, California.....	20
Dutch, El Dorado County, California.....	26
Dyer, Lake County, Colorado.....	143

E.

	Page.
Eagle, El Dorado County, California.....	27
Eagle, Inyo County, California.....	29
Eagle, Lander County, Nevada.....	98, 108
Eagle, Moore County, North Carolina.....	174
Eagle Copper, Calaveras County, California.....	23
Eastern Belle, Esmeralda County, Nevada.....	93
East New York, Placer County, California.....	63
East Roe, Clear Creek County, Colorado.....	146
Edward, Los Angeles County, California.....	31
El Capitan, Nevada County, California.....	56
El Dorado, Eureka County, Nevada.....	94, 96
El Dorado, San Diego County, California.....	34
Elgin, Lake County, Colorado.....	137
Elise, Plumas County, California.....	70
Elizabeth, Nye County, Nevada.....	100
Elk, Gunnison County, Colorado.....	150
Elkhorn, Boise County, Idaho.....	123
Elmira, Boise County, Idaho.....	123
El Plano, Inyo County, California.....	29
Emancipation, Boulder County, Colorado.....	147
Emily Ann, Lander County, Nevada.....	98
Emma, Alturas County, Idaho.....	123
Emma, Clear Creek County, Colorado.....	146
Emma, Nevada County, California.....	62
Emma, Plumas County, California.....	74
Empire, Amador County, California.....	13, 90
Empire, Gilpin County, Colorado.....	144
Empire, Nevada County, California.....	53
Empire, Pima County, Arizona.....	115
Empire, Siskiyou County, California.....	82
Empire, Tulare County, California.....	83
English, Nevada County, California.....	62
Enterprise, Esmeraldo County, Nevada.....	92
Enterprise, Inyo County, California.....	29
Equator, Clear Creek County, Colorado.....	146
Equator, Esmeralda County, Nevada.....	92
Erie, Eureka County, Nevada.....	96
Esmeralda, Esmeralda County, Nevada.....	93
Essex Inyo County, California.....	28
Essex No. 2, Inyo County, California.....	28
Estella, Alturas County, Idaho.....	123
Estella, Humboldt County, Nevada.....	97
Ethan Allen, Humboldt County, Nevada.....	97
Eudora, Utah County, Utah.....	128
Eureka, Calaveras County, California.....	19
Eureka, Davidson County, North Carolina.....	169
Eureka, Lake County, Colorado.....	60
Eureka, Lempi County, Idaho.....	124
Eureka, Mariposa County, California.....	36
Eureka Consolidated, Eureka County, Nevada.....	94, 96, 108, 235
Eureka Consolidated, Sierra County, California.....	81
Eureka, No. 2, Nevada County, California.....	56
Evans, Tuolumne County, Colorado.....	84
Evening Star, Lake County, California.....	140, 141
Evergreen, Alturas County, Idaho.....	123
Excelsior, Calaveras County, California.....	22
Excelsior, Eureka County, Nevada.....	96
Excelsior, Nevada County, California.....	61
Excelsior, Placer County, California.....	66
Excelsior Silver, Utah County, Utah.....	128
Excelsior Water and Mining, Yuba County, California.....	88, 90, 235
Exchange, White Pine County, Nevada.....	106
Exchequer, Storey County, Nevada.....	101
Extra, Shasta County, California.....	74

F.

	Page.
Faber, El Dorado County, California.....	28
Fair Play, Chaffee County, Colorado.....	153
Fair Play, Sierra County, California.....	80
Fairview, Lawrence County, Dakota.....	161
Fairview, Utah County, Utah.....	129
Faithful Boy, Lemhi County, Idaho.....	124
Fall Creek, Nevada County, California.....	59
Father de Smet, Lawrence County, Dakota.....	161, 163, 167, 235
Feather River and Ophir, Butte County, California.....	18
Fentress, Guilford County, North Carolina.....	169
Ferguson, Mariposa County, California.....	36
Ferris, Mecklenburg County, North Carolina.....	170
Findley, Lumpkin County, Georgia.....	178, 179, 235
First Chance, Utah County, Utah.....	128
Fisher, Gunnison County, Colorado.....	150
Flanagan Blue Light, Los Angeles County, California.....	31
Fletcher, Calaveras County, California.....	22
Flora Belle, Lawrence County, Dakota.....	161
Florence, Lake County, Colorado.....	143
Florence, Yuba County, California.....	89
Florida Hill, Owyhee County, Idaho.....	125
Forest Gold, Tuolumne County, California.....	85
Forest King, Boise County, Idaho.....	123
Forest Queen, Gunnison County, Colorado.....	150
Forest Queen, Sierra County, California.....	79
Forest Queen, Tuolumne County, California.....	85
Forlorn, Nye County, Nevada.....	100
Forlorn Hope, Nevada County, California.....	59
Forlorn Hope, Yuba County, California.....	88
Fortuna, Calaveras County, California.....	21
Fortuna, Nevada County, California.....	55
Fraction, Lawrence County, Dakota.....	161
Franklin, Placer County, California.....	63
Fred. Rogers, Clear Creek County, Colorado.....	146
Freeborn Cañon, Inyo County, California.....	29
Freedman, El Dorado County, California.....	28
Freedom, Lemhi County, Idaho.....	124
Freeland, Clear Creek County, Colorado.....	146, 235
Freelon, Alturas County, Idaho.....	123
Fremont, Owyhee County, Idaho.....	125
French Creek, Butte County, California.....	18
Fresno Enterprise, Fresno County, California.....	34, 90
Prompton, Boise County, Idaho.....	123
Frost and Rule, Butte County, California.....	16
Fryer Hill, Lake County, Colorado.....	143
Fuller, Mariposa County, California.....	37
Fuller and Hayt, Mono County, California.....	49
Fullerton, Gilpin County, Colorado.....	144

G.

Gage-Hagaman, Lake County, Colorado.....	137
Gaity Flat, Yuba County, California.....	89
Galena, Gunnison County, Colorado.....	151
Garden Ledge, Nevada County, California.....	56
Garden Gulch, Trinity County, California.....	87
Gardiner's Point, Sierra County, California.....	78
Gardner Hill, Guilford County, North Carolina.....	169
Garfield, Nevada County, California.....	59
Garrison, Eureka County, Nevada.....	94, 96
Garrison, Tulare County, California.....	83
Gazelle, Nevada County, California.....	53
General Jackson, Esmeralda County, Nevada.....	92
Genesee Valley, Plumas County, California.....	74
Georgetown Divide, El Dorado County, California.....	26
Georgia Hill, Placer County, California.....	66
German, Calaveras County, California.....	24

	Page.
Germania, Utah.....	127
Giant, Lawrence County, Dakota.....	161, 167
Gila, Nye County, Nevada.....	100, 108
Gilbert, Placer County, California.....	66
Gillespie, Nevada County, California.....	62
Gilpin, Clear Creek County, Colorado.....	146
Gladstone, Amador County, California.....	13
Glass Pendery, Lake County, Colorado.....	143
Gleeson, Calaveras County, California.....	20
Glencoe Consolidated, Calaveras County, California.....	23
Glory, Humboldt County, Nevada.....	97
Godfrey Gravel, Nevada County, California.....	54, 90
Golando, Boise County, Idaho.....	123
Gold Bar, El Dorado County, California.....	26
Gold Bluff, Sierra County, California.....	80
Golden Crown, Mono County, California.....	49
Golden Eagle, Lassen County, California.....	34
Golden Eagle, Pinal County, Arizona.....	111
Golden Fleece, Boise County, Idaho.....	123
Golden Flint, Gilpin County, Colorado.....	144
Golden Gate, Placer County, California.....	66
Golden Leaf, Gunnison County, Colorado.....	149
Golden Star, Inyo County, California.....	31
Golden Star, Lawrence County, Dakota.....	161, 163
Golden State, El Dorado County, California.....	26
Golden Terra, Lawrence County, Dakota.....	161, 163, 167
Gold Hill, Boise County, Idaho.....	123
Gold Hill, Rowan County, North Carolina.....	170
Gold Ring, Lander County, Nevada.....	98
Gold Run, Placer County, California.....	63
Gold Seeker, Utah County, Utah.....	129
Goldstein, Gunnison County, Colorado.....	149
Gold Stripe, Lawrence County, Dakota.....	167
Gold Stripe, Plumas County, California.....	68, 235
Gold Valley, Sierra County, California.....	80
Good Hope, Nye County, Nevada.....	100
Good Hope Extension, Sierra County, California.....	79
Goodshaw, Mono County, California.....	41, 237
Gould and Curry, Storey County, Nevada.....	101, 105, 235
Gover, Amador County, California.....	12
Grand Army, Gunnison County, Colorado.....	151
Grand Junction, Custer County, Dakota.....	160
Grand Republic, Gunnison County, Colorado.....	151
Grand Prize, Elko County, Nevada.....	92, 108, 235
Grand Trunk, Esmeralda County, Nevada.....	93
Grand Victory, El Dorado County, California.....	25
Grand View, Boulder County, Colorado.....	147
Grand View and Caribou, Utah County, Utah.....	129
Grant, Eureka County, Nevada.....	94, 96
Grant, Lake County, Colorado.....	137
Gray Eagle, Gunnison County, Colorado.....	149
Great Basin, Utah.....	130
Great Hopes, Lake County, Colorado.....	143
Great Western, Humboldt County, Nevada.....	97
Great Western, Nye County, Nevada.....	100
Green Mountain, Calaveras County, California.....	21
Green Mountain, Plumas County, California.....	74, 90, 235
Green Mountain Tunnel, El Dorado County, California.....	28
Greenwood, El Dorado County, California.....	26
Gregory, Gilpin County, Colorado.....	144
Grey Eagle, Tuolumne County, California.....	85
Griffith Consolidated, El Dorado County, California.....	26
Grizzly, Sierra County, California.....	81
Grochen and French, Elko County, Nevada.....	92
Gross, El Dorado County, California.....	25
Grub Flat, Plumas County, California.....	74
Guadalupe, Inyo County, California.....	29
Gunnell, Gilpin County, Colorado.....	145
Gunshot, Chaffee County, Colorado.....	153

	Page.
Gurnley, Inyo County, California	29
Gwin, Calaveras County, California	21
H.	
Haile, Lancaster County, South Carolina	176
Hale and Norcross, Storey County, Nevada	101, 105, 235
Half-way House, Lake County, Colorado	143
Hallstead, Plumas County, California	71
Hammer and Millgate, Sacramento County, California	32
Hammil, Placer County, California	64
Hansen Mill, El Dorado County, California	28
Happy Camp, Napa County, California	36
Happy Valley, Calaveras County, California	21
Harcourt, Yuba County, California	89
Hard Pan, Plumas County, California	70
Harkaway, Gilpin County, Colorado	144
Harrison, Lake County, Colorado	137
Harshaw, Pima County, Arizona	113, 117, 237
Hart and Griffith, El Dorado County, California	26
Harteny, Nevada County, California	54
Hartford, Custer County, Dakota	160
Hartman, Rowan County, North Carolina	169
Hartman Bar, Napa County, California	36
Harvey, Los Angeles County, California	31
Harvey, Nye County, Nevada	100
Harvey, Trinity County, California	87
Hathaway, Nevada County, California	59
Hawley, Nevada County, California	62
Hayden, San Diego County, California	34
Haynes, Rowan County, North Carolina	169
Hazel Dell, Tuolumne County, California	84
Hazel Dell South, Tuolumne County, California	84
Headlight, Mono County, California	47
Heath, Plumas County, California	70
Hecla, Custer County, Colorado	147
Henrietta, Lake County, Colorado	143
Henrietta, Utah County, Utah	128
Henry Paine, Yuba County, California	89
Hercules, Clear Creek County, Colorado	146
Herkimer, Clear Creek County, Colorado	146
Hettington, Nevada County, California	59
Hibernia, Lake County, Colorado	140, 142, 143, 158, 235
Hidalgo, Inyo County, California	29
Hidden Treasure, Gilpin County, Colorado	144
Hidden Treasure, Placer County, California	64
Hidden Treasure, Utah County, Utah	128
Highland, Lawrence County, Dakota	161, 163, 167
Highland, Sierra County, California	81
Highland Chief, Alturas County, Idaho	123
Highland Chief, Esmeralda County, Nevada	93
Highland Chief, Lake County, Colorado	142, 143
High Point, Plumas County, California	74
Hightown, Lumpkin County, Georgia	178
Hillside, Lincoln County, Nevada	98, 108
Hirschman, Nevada County, California	56
Hitchcock, Inyo County, California	31
Hite, Mariposa County, California	37
Hi Yy, Siskiyou County, California	82
Hoffman, Placer County, California	64
Holland, Pima County, Arizona	113
Holmes, Esmeralda County, Nevada	92
Holtzhauser, Rowan County, North Carolina	169
Homer, Mono County, California	49
Homer, Trinity County, California	87
Homestake, Lawrence County, Dakota	161, 163, 164, 167, 235
Homestake, Plumas County, California	73
Hong Lee, Elko County, Nevada	92
Hoosac, Eureka County, Nevada	96

	Page.
Hoosic, Mariposa County, California	37
Hoosier, Calaveras County, California	20
Hoosier Bar, El Dorado County, California	26
Hope, Los Angeles County, California	31
Hopkins Consolidated, Lassen County, California	34
Horn, Utah	127, 235
Hornet, Tuolumne County, California	84
Horn Silver, Custer County, Colorado	148
Horton, Custer County, Colorado	148
Hoskins, El Dorado County, California	28
Houston, Moore County, North Carolina	174
Howie, Union County, North Carolina	174
Hubbell, Boise County, Idaho	123
Hubbert, San Diego County, California	34
Hudson, Utah County, Utah	129
Hukill, Clear Creek County, Colorado	146, 235
Humboldt, Custer County, Colorado	147
Humbug, Lander County, Nevada	98
Humphrey, Sacramento County, California	32
Humphrey, Yuba County, California	88
Hunkey, San Bernardino County, California	32
Hurricane, San Bernardino County, California	33

I.

Ida, Eureka County, Nevada	96
Ida Easley, Napa County, California	33
Idaho, Nevada County, California	51-90
I Don't Care, Lassen County, California	34
Illinois, Nevada County, California	62
Independence, Elko County, Nevada	92, 108, 236
Independent, Placer County, California	66
Independent, Sierra County, California	81
Indiana, Inyo County, California	31
Indian Canon, Placer County, California	66
Indian Creek, Lemhi County, Idaho	124
Indian Hill, Placer County, California	63
Indian Queen, Esmeralda County, Nevada	94, 108
Indian Queen, Mono County, California	50
Indian Queen, Sierra County, California	81
Indian Ranch, Yuba County, California	89
Indian Scout, Inyo County, California	29
Indian Valley, Plumas County, California	68
Inez, El Dorado County, California	28
Invincible, Custer County, Colorado	147
Iowa, Yuba County, California	89
Iowa Consolidated, Humboldt County, Nevada	97
Iowaville, El Dorado County, California	26
Irene, Pinal County, Arizona	112
Irish Ambassador, Eureka County, Nevada	94, 96
Iron, Lincoln County, Nevada	99
Iron Chief, Gunnison County, Colorado	150
Iron Clad, Nevada County, California	59
Iron Mine, Lake County, Colorado	142, 143, 158, 237
Iron Point, Humboldt County, Nevada	97
Irwin, Gunnison County, Colorado	149
Irwin, Lyon County, Nevada	99
Isabella, Pinal County, Arizona	112

J.

Jackson, Eureka County, Nevada	96
Jackson, Lander County, Nevada	98
Jackson, Owyhee County, Idaho	125
Jamestown, Alaska	168
J. A. Pearch, Humboldt County, California	35
John Jay, Boulder County, Colorado	147
Johnson, El Dorado County, California	28
Johnson, Siskiyou County, California	82

	Page.
Johnson, Trinity County, California	88
Jones, Lumpkin County, Georgia	178
Josephine, Los Angeles County, California	31
Julia, Alturas County, Idaho	123
Julia, Storey County, Nevada	105
Julian, Custer County, Colorado	147
Julian, Placer County, California	66
Juniper, Lassen County, California	34
Jupiter, Amador County, California	13
Jupiter, Mono County, California	44
Justice, Storey County, Nevada	101, 108, 237
Justice, Tuolumne County, California	84

K.

Karch, Sierra County, California	81
Kate, Custer County, Colorado	147
Kate Hardy, Sierra County, California	80
Kearsing, Amador County, California	13
Keefer, Calaveras County, California	21
Keeler, Inyo County, California	29
Kennedy, Amador County, California	13
Kent County, Gilpin County, Colorado	145
Kentuck, Butte County, California	17
Kerso, Inyo County, California	28
Keystone, Amador County, California	12
Keystone, Boulder County, Colorado	147
Keystone, Sierra County, California	79
Keystone Consolidated, Amador County, California	13, 90
Kim and Shea, Shasta County, California	75
Kimball, El Dorado County, California	27
Kimber, Gilpin County, Colorado	144
King Bird, Butte County, California	18
King's Mountain, Gaston County, North Carolina	171
King Solomon, Gunnison County, Colorado	149
King Solomon, Pennington County, Dakota	160
Kip and Buell, Gilpin County, Colorado	144
Kirk and Sinclair, Humboldt County, California	35
Kirtley, Lemhi County, Idaho	124
Kitty, Tuolumne County, California	84
Klamath Quartz, Siskiyou County, California	82, 90
Klein, Trinity County, California	87
Knox and Osborn, Calaveras County, California	20

L.

La Belle, Utah County, Utah	128
La Belle France, Calaveras County, California	20
Lady Catharina, Utah County, Utah	129
Lady Emma, El Dorado County, California	28
La Grange, Stanislaus County, California	32, 90
Laird, Placer County, California	66
Land, White County, Georgia	180
Lang Syne, Humboldt County, Nevada	97
La Plata, Lake County, Colorado	137, 140, 236
La Plata, Montana	126
La Salle, Nye County, Nevada	100
Last Chance, Boulder County, Colorado	147
Last Chance, El Dorado County, California	27
Last Chance, Gunnison County, Colorado	150
Last Chance, Owyhee County, Idaho	125
Last Chance, Placer County, California	66
Last Chance, Siskiyou County, California	82
Lecompton, Nevada County, California	56
Leadville, Lake County, Colorado	137, 140, 236
Leavenworth Chieftain, Custer County, Colorado	147
Leeds, Utah County, Utah	129, 236
Lefla, Nye County, Nevada	100
Leopard, Elko County, Nevada	92, 108, 236

	Page.
Leviathan, Storey County, Nevada.....	101, 237
Lewis, White County, Georgia.....	180
Lexington, Chaffee County, Colorado.....	153
Lexington, Lawrence County, Dakota.....	162
Liberty, Nye County, Nevada.....	100
Lightning, Gunnison County, Colorado.....	149
Limestone, Butte County, California.....	15
Lincoln, Alpine County, California.....	12
Lincoln, Amador County, California.....	12
Lisbon, Mono County, California.....	48
Little Bonanza, Yuba County, California.....	89
Little Chief, Lake County, Colorado.....	137, 140, 143, 158, 236
Little Cloud, Utah County, Utah.....	129
Little Cross, Gunnison County, Colorado.....	149
Little Ella, Lake County, Colorado.....	143
Little Emma, Mono County, California.....	49
Little Giant, Lake County, Colorado.....	141, 143
Little Grizzly, Sierra County, California.....	78
Little Johnnie, Lake County, Colorado.....	143
Little Keneshaw, Butte County, California.....	15
Little Nellie, Gunnison County, Colorado.....	149
Little Netta, Lawrence County, Dakota.....	164
Little Pittsburg, Lake County, Colorado.....	140, 143, 158, 236
Live Oak, Placer County, California.....	66
Live Yankee, Nevada County, California.....	56
Live Yankee, Sierra County, California.....	81
Live Yankee, Utah County, Utah.....	128
Lockhart, Lumpkin County, Georgia.....	178
Lodi Alt, Pennington County, Dakota.....	160
Lone Pine, Eureka County, Nevada.....	96
Lone Star, Custer County, Colorado.....	147
Lone Star, Nevada County, California.....	59
Long Creek, Gaston County, North Carolina.....	171
Loomis, El Dorado County, California.....	28
Los Angeles, Inyo County, California.....	29
Los Angeles, Los Angeles County, California.....	31
Lost Camp, Placer County, California.....	66
Lost Maid, Utah County, Utah.....	129
Lott, Butte County, California.....	18
Louisiana, Tuolumne County, California.....	84
Lovejoy, Plumas County, California.....	74
Lower Gold Bluff, Humboldt County, California.....	35
Lubricator, Gunnison County, Colorado.....	149
Lucille, Custer County, Colorado.....	148
Lucky Dog, Humboldt County, Nevada.....	97
Lucky Hill, Esmeralda County, Nevada.....	92
Lucky Hesperus, Clear Creek County, Colorado.....	146
Lyon Mill and Mine, El Dorado County, California.....	24

M.

McChesney, Yuba County, California.....	89
McConnell and Durette, Butte County, California.....	18
McCracken, Mohave County, Arizona.....	110
Macedonia, Baker County, Oregon.....	118
McElroy, Calaveras County, California.....	22
McGinn, Mecklenburg County, North Carolina.....	170
Mackerel Back, Nevada County, California.....	59
Mackey, Gilpin County, Colorado.....	144
McMillan, Lawrence County, Dakota.....	167
McMillan, Pinal County, Arizona.....	112
McNish, Yuba County, California.....	89
Macon City, Eureka County, Nevada.....	96
Magalia, Butte County, California.....	17
Magalia, Tuolumne County, California.....	85
Magenta, Eureka County, Nevada.....	96
Maggie, Elko County, Nevada.....	92
Maggie, Inyo County, California.....	28
Magnet, Clear Creek County, Colorado.....	146

	Page.
Magnet, Esmeralda County, Nevada	92
Magnolia, York County, South Carolina	177
Mahoney, Amador County, California	12
Malloy, Esmeralda County, Nevada	92
Maltman, Nevada County, California	55
Mameluke, El Dorado County, California	28
Mammoth, Baker County, Oregon	118
Mammoth, Boise County, Idaho	123
Mammoth, Calaveras County, California	19
Mammoth, Humboldt County, Nevada	97
Mammoth, Mono County, California	47, 90
Mammoth, White Pine County, Nevada	106
Mammoth Bar, Placer County, California	65
Mammoth Tunnel, Butte County, California	18
Manhattan, Lander County, Nevada	97, 108
Manzanita, Colusa County, California	35
Maple Leaf, Gunnison County, Colorado	149
Mariposa, Inyo County, California	29
Mariposa, Mariposa County, California	37, 237
Markeson and Kemdson, Humboldt County, California	35
Martinette, Sierra County, California	81
Martin Walling, Mariposa County, California	36
Martin White, White Pine County, Nevada	106, 108, 236
Mary Bee, Mono County, California	49
Mary Ellen, Utah County, Utah	128
Maryland Consolidated, Mono County, California	42
Mary Wilder, Humboldt County, Nevada	97
Masonic, Sierra County, California	81
Massen Girl, Gunnison County, Colorado	150
Mastodon, Tuolumne County, California	84
Matchless, Lake County, Colorado	142, 143
Matthewson, Siskiyou County, California	82
Mayflower, Clear Creek County, Colorado	146, 238
Mayflower, Lincoln County, Nevada	98
Mayflower, Placer County, California	64
Mayflower and Flora, Utah County, Utah	129
May Lundy, Mono County, California	49
Maynard and Duncan, El Dorado County, California	28
May Queen, Alturas County, Idaho	123
Melvina, Boulder County, Colorado	147
Mendhe, Lincoln County, Nevada	99
Merced Hydraulic, Mariposa County, California	37
Meredith, Butte County, California	17
Merrifield, Nevada County, California	57
Mexican, Mariposa County, California	37
Mexican, Pinal County, Arizona	112
Mexican, Plumas County, California	73
Mexican, Storey County, Nevada	101, 105, 238
Miami, Pinal County, Arizona	112
Michigan, Sierra County, California	76
Midas, Clear Creek County, Colorado	146
Midas, Gilpin County, Colorado	144
Mill Creek, Yuba County, California	89
Miller, Placer County, California	66
Miller, Utah County, Utah	128
Milton, Nevada County, California	61, 90
Minard, Gunnison County, Colorado	150
Mineral Hill, Eureka County, Nevada	96
Mineral Hill, Gunnison County, Colorado	149
Mineral Creek, Pinal County, Arizona	112, 238
Miner Boy, Lake County, Colorado	142, 238
Minerva, Butte County, California	16
Minnesota, Pennington County, Dakota	160
Miocene, Butte County, California	16
Mississippi Bar, Butte County, California	18
Modoc, Amador County, California	13
Modoc, El Dorado County, California	26
Modoc, Inyo County, California	30
Mohawk, Nevada County, California	61, 90

	Page
Mohigan, Nevada County, California	61
Mohrman, Tuolumne County, California	85
Mokelumne Hill, Calaveras County, California	21
Mollie, Inyo County, California	29
Mollie Mack, Gunnison County, Colorado	149
Monarch, Alturas County, Idaho	123
Monarch, Calaveras County, California	21
Monarch, Chaffee County, Colorado	153
Monarch, Gunnison County, Colorado	151
Monitor, El Dorado County, California	26
Monmouth Kansas, Gilpin County, Colorado	145
Mono, Mono County, California	39, 238
Monroe, Eureka County, Nevada	96
Montana, Alaska	168
Montana, Lemhi County, Arizona	124
Monte Christo, Gunnison County, Colorado	150
Monte Christo, Mono County, California	47
Monte Christo, Plumas County, California	69
Monte Christo, Storey County, Nevada	101, 104, 105
Monte Christo, Trinity County, California	87
Monteith, Humboldt County, Nevada	97
Monticello, Colusa County, California	35
Montezuma, Humboldt County, Nevada	97
Montezuma, Siskiyou County, California	82
Montezuma, Trinity County, California	87
Monumental, Baker County, Oregon	118
Moody Cañon, Placer County, California	66
Moonlight, Humboldt County, Nevada	97
Moose, Park County, Colorado	148, 236
Morey, Nye County, Nevada	100
Morgan, Utah County, Utah	127
Morning Star, Lake County, Colorado	140, 141, 143
Morning Star, Placer County, California	66
Morrison, Trinity County, California	87
Morris Ravine, Butte County, California	16
Moser, Calaveras County, California	19
Mountain Chip, Boise County, Idaho	123
Mountaineer, Nevada County, California	57
Mountain Girl, Esmeralda County, Nevada	93
Mountain Lion, Boulder County, Colorado	147
Mountain Pride, White Pine County, Nevada	106
Mountain Quartz, Sierra County, California	81
Mountain View, Fresno County, California	34
Mount Auburn, Nevada County, California	56
Mount Diablo, Esmeralda County, Nevada	92, 108
Mount Jefferson, Tuolumne County, California	85
Mount Potosi, Esmeralda County, Nevada	92, 108
Mount Pleasant, El Dorado County, California	27
Mount Rosa, Humboldt County, Nevada	97
Mugginsville, Sierra County, California	76
Murchie, Nevada County, California	55, 90
Murphy, El Dorado County, California	28

N.

Nagle, El Dorado County, California	26
Nash, Trinity County, California	86
Nautelius, Nevada County, California	57
Navajoe, Elko County, Nevada	92, 108, 238
Nevada, Storey County, Nevada	101
Nevada City, Nevada County, California	55
Nevada Reservoir, Yuba County, California	89
Never Sweat, Baker County, Oregon	118
Newberry, Plumas County, California	74
New Castle, Placer County, California	66
New Coso, Inyo County, California	29
New England, Esmeralda County, Nevada	93
New England, Nevada County, California	56
New Gold Run, Placer County, California	63

	Page.
New Hope, Lassen County, California	34
Newman, Humboldt County, California	35
Newton, El Dorado County, California	26
New World, Kern County, California	31
New York, Baker County, Oregon	118
New York, Storey County, Nevada	101
New York and Bodie, Mono County, California	43
New York and Calaveras, Calaveras County, California	24
New York and Colorado, Gilpin County, Colorado	144, 236
New York Hill, Nevada County, California	52
New York Placer, Calaveras County, California	24
Niagara, Shasta County, California	74
Niagara, Sierra County, California	76
Nip and Tuck, Lemhi County, Idaho	124
Ni Wot, Clear Creek County, Colorado	146
Noonday, Mono County, California	40, 90
Northern Belle, Esmeralda County, Nevada	92, 108, 236
North American, Calaveras County, California	21
North American, Lemhi County, Idaho	124
North Bloomfield, Nevada County, California	60, 90
North Noonday, Mono County, California	40, 90
North Rapidan, Lyon County, Nevada	99
North Star, Alaska	168
North Star, Boise County, Idaho	123
North Star, El Dorado County, California	26
North Star, Placer County, California	66
Norwich, Calaveras County, California	23

O.

Oak Grove, Siskiyou County, California	82
Oakland, Nevada County, California	54
Oak Ranch, El Dorado County, California	28
Oaks and Reese, Mariposa County, California	38
Ocola, Nevada County, California	59
Ohio, Humboldt County, Nevada	97
Ohio, Lincoln County, Nevada	98
Ohio, Placer County, California	66
Ohio, Sierra County, California	77
Ohio and Missouri, Lake County, Colorado	137
Old Abe, Lawrence County, Dakota	161, 167
Old Bill, Custer County, Dakota	160
Old Calistoga, Napa County, California	33
Old Channel, Butte County, California	18
Old Charley, Custer County, Dakota	160
Old Frick, El Dorado County, California	28
Old Judge, El Dorado County, California	28
Old Mexico, Gunnison County, Colorado	150
Old Sheik, Gunnison County, Colorado	150
Old Telegraph, Utah County, Utah	127
Old Tuolumne, Tuolumne County, California	85
Old Washington, Shasta County, California	75
Olsen, Tuolumne County, California	86
Omaha, Nevada County, California	54
Oneida, Amador County, California	14
Oneida Chief, Nevada County, California	55
Ontario, Gunnison County, Colorado	150
Ontario, Utah County, Utah	127, 236
Orphan, Utah County, Utah	129
Ophir, Alturas County, Idaho	123
Ophir, El Dorado County, California	25
Ophir, Gilpin County, Colorado	155
Ophir, Gunnison County, Colorado	150
Ophir, Storey County, Nevada	101, 105, 108, 236
Oriental, Esmeralda County, Nevada	93, 108
Oriental and Belmont, Eureka County, Nevada	96
Oriflamme, San Bernardino County, California	32
Original Amador, Amador County, California	12, 90
Original Baltic, Eureka County, Nevada	94

	Page.
Orleans, Nevada County, California.....	62
Oro, Butte County, California.....	16
Oro, Mono County, California.....	42
Orobilla, Butte County, California.....	15
Oro Cache, Lawrence County, Dakota.....	162
Oro Fino, Placer County, California.....	65
Oro La Plata, Lake County, Colorado.....	143
Osgood and Stayten, Tuolumne County, California.....	84
Oshawa, Yuba County, California.....	48
Otter Creek, El Dorado County, California.....	27
Overman, Storey County, Nevada.....	101, 105, 238

P.

Pacific, Amador County, California.....	13
Pacific, El Dorado County, California.....	25
Pacific, Siskiyou County, California.....	82
Pah Ute, Kern County, California.....	31
Panamint, Inyo County, California.....	21
Paradise Valley, Humboldt County, Nevada.....	97, 108
Paragon, Placer County, California.....	66
Park, El Dorado County, California.....	28
Parrenir, Inyo County, California.....	29
Parson, El Dorado County, California.....	28
Paul Pry, Eureka County, Nevada.....	96
Paymaster, Ada County, Idaho.....	122
Paymaster, Boise County, Idaho.....	123
Paymaster, White Pine County, Nevada.....	106
Peabody, Nevada County, California.....	54
Pearson and White, Eureka County, Nevada.....	96
Peck, Shasta County, California.....	75
Pelican, Clear Creek County, Colorado.....	146
Pelton, El Dorado County, California.....	28
Penders, Nevada County, California.....	62
Penobscot, Calaveras County, California.....	20
Penobscot, Custer County, Dakota.....	160
Pennsylvania, El Dorado County, California.....	27
Pennsylvania, Sierra County, California.....	79
Pentin, Eureka County, Nevada.....	96
Pepper, Yuba County, California.....	89
Perseverance, Inyo County, California.....	29
Perseverance, Lawrence County, Dakota.....	162
Peters, Clear Creek County, Colorado.....	146
Peterson, Eureka County, Nevada.....	96
Phoenix, Eureka County, Nevada.....	96, 108
Phoenix, Gunnison County, Colorado.....	150
Phoenix, Sierra County, California.....	81
Phoenix and Potosi, Nevada County, California.....	55
Piepie Hill, El Dorado County, California.....	28
Pigeon Roost, Lumpkin County, Georgia.....	178, 179
Pilz, Alaska.....	168
Pine Tree, Mariposa County, California.....	37
Pioneer, Amador County, California.....	13
Pioneer, Eureka County, Nevada.....	96
Pioneer, Gunnison County, Colorado.....	151
Pittsburg, Nevada County, California.....	62
Pittsburg, Utah County, Utah.....	129
Piute, Eureka County, Nevada.....	96
Piute Mill, Inyo County, California.....	31
Placerville, El Dorado County, California.....	25
Plata Verde, Custer County, Colorado.....	147
Pliocene, Sierra County, California.....	77
Plumas, Lander County, Nevada.....	98
Plumas Eureka, Plumas County, California.....	67, 90, 236
Plumas National, Plumas County, California.....	68
Pocahontas, Custer County, Colorado.....	148
Point, Gunnison County, Colorado.....	151
Polar Star, Nevada County, California.....	62
Polar Star, Placer County, California.....	63

	Page.
Polonia, Custer County, Colorado	147
Pool, Mariposa County, California	38
Portis, Nash County, North Carolina	175
Portland, Lawrence County, Dakota	162
Portuguese, Nevada County, California	62
Potosi, Amador County, California	13
President, Idaho County, Idaho	124
Price, Trinity County, California	88
Prince, Polk County, North Carolina	175
Proserpine, Lumpkin County, Georgia	179
Prospectus, Esmeralda County, Nevada	93
Providence, Nevada County, California	57
Prussian, Boulder County, Colorado	147

Q.

Quaker Hill, Nevada County, California	62
Queen Bee, Pennington County, Dakota	160
Queen Bee, Mono County, California	43
Queen of the Hills, Lawrence County, Dakota	161
Quien Sabe, Plumas County, California	71
Quincy, Esmeralda County, Nevada	93
Quing Sing, Shasta County, Colorado	75

R.

Rabbit Creek, Boise County, Idaho	123
Raccoon Bar, Humboldt County, California	35
Racine Boy, Custer County, Colorado	148
Racine Boy, Gunnison County, Colorado	150
Rainbow, Placer County, California	64
Ramshorn, Lemhi County, Idaho	124
Randolph, Gilpin County, Colorado	144
Rapp and Hillman, Calaveras County, California	22
Raspberry, Calaveras County, California	22
Rattlesnake, Esmeralda County, Nevada	93
Ray, Mecklenburg County, North Carolina	170
Raymond and Ely, Lincoln County, Nevada	98, 108, 236
Red Bird, Alturas County, Idaho	123
Red Bluff, Shasta County, California	74
Red Cloud, Mono County, California	40
Red Cloud, Utah County, Utah	128
Red Hill, Butte County, California	18
Red Wheel, Calaveras County, California	24
Reed, El Dorado County, California	25
Reed, Inyo County, California	30
Rendleman, Rowan County, California	169
Rescue, Inyo County, California	29
Reynolds, White County, Georgia	180
Rhine Dollar, Mono County, California	49
Rhymer, Rowan County, North Carolina	169
Ricci, Nevada County, California	61
Richard, Napa County, California	36
Richmond, Eureka County, Nevada	94, 96, 108, 236
Rigney, Sacramento County, California	32
Ringgold, El Dorado County, California	25
Rising Sun, Ada County, Idaho	122
Rising Sun, Boise County, Idaho	123
Rising Sun, Sierra County, California	81, 90, 236
Riverside, Calaveras County, California	23
Riverside, Tuolumne County, California	84
Robert E. Lee, Lake County, Colorado	140, 142, 143
Robinson, El Dorado County, California	28
Robinson, Gaston County, North Carolina	171
Robinson Consolidated, Lake County, Colorado	140, 158, 236
Rob Roy, Owyhee County, Idaho	125
Rock Creek, Nevada County, California	62
Rock Creek, Placer County, California	65
Rocky Bar, Nevada County, California	53

	Page.
Rodesino, Calaveras County, California	24
Rollins, Gilpin County, Colorado	144
Rosario, Inyo County, California	29
Rothschilds, Esmeralda County, Nevada	93
Rough and Ready, Gunnison County, Colorado	150
Rough Diamond, Calaveras County, California	21
Rouman, Rowan County, North Carolina	169
Round Valley, Plumas County, California	68
Ruby, Sierra County, California	81
Ruby Chief, Gunnison County, Colorado	150
Ruby Dunderberg, Eureka County, Nevada	94, 96
Ruby King, Gunnison County, Colorado	150
Rudesil, Mecklenburg County, North Carolina	170
Rudolph, Utah County, Utah	129
Rule, Trinity County, California	87
Russler, Utah County, Utah	128

S.

Sacks, Placer County, California	63
Sacramento, Placer County, California	64
Safe Deposit, Calaveras County, California	21
Sailor Flat, Nevada County, California	61
Saint John, Baker County, Oregon	118
Saint Lawrence, Gunnison County, Colorado	150
Saints Rest, Humboldt County, California	35
Sala, Eureka County, Nevada	94
Salamander, Eureka County, Nevada	94
Sam Davis, Butte County, California	18
San Christian, Montgomery County, North Carolina	174
San Clais, Butte County, California	18
Santa Barbara, Inyo County, California	29
Santiago, Inyo County, California	29
Santiago, Los Angeles County, California	31
Saratoga, Esmeralda County, Nevada	92
Sarchfield, Utah County, Utah	120
Sardine, El Dorado County, California	26
Savage, Storey County, Nevada	101, 104, 105, 236
Savercool, Plumas County, California	69
Savovam Bar, Humboldt County, California	35
Saxon, Clear Creek County, Colorado	146
Scooper, Lake County, Colorado	143
Scorpion, Alturas County, Idaho	123
Scorpion, Shasta County, California	74
Scotia, Nevada County, California	54
Sears Union, Sierra County, California	77
Sebastopol, Nevada County, California	53
Sebastopol, Placer County, California	64
S. E. Griscomb, Lumpkin County, Georgia	178
Selz, Siskiyou County, California	82
Seven Thirty, Clear Creek County, Colorado	146
Shady Glen, Placer County, California	63
Shafer, Yakima County, Washington	121
Shall See, Calaveras County, California	21
Shanghai, Nevada County, California	62
Sharper, Nevada County, California	62
Shawmut, Calaveras County, California	22
Sheep Ranch, Calaveras County, California	24
Sherman, Mecklenburg County, North Carolina	171
Sherman, Nevada County, California	62
Shiloh, Lander County, Nevada	98
Shoo Fly, Trinity County, California	87
Shuford, Catawba County, North Carolina	171
Sierra, Utah County, Utah	129
Sierra Buttes, Sierra County, California	81, 90
Signal, Mohave County, Arizona	110
Sill and Quick, Nevada County, California	62
Silver Bell, Utah County, Utah	128
Silver Bow, Montana	126

	Page.
Silver Cliff, Custer County, Colorado.....	147, 238
Silver Cloud, Utah County, Utah.....	129
Silver Coin, Custer County, Colorado.....	148
Silver Connor, Eureka County, Nevada.....	94, 96
Silver Cord, Lake County, Colorado.....	143
Silver Era, Pinal County, Arizona.....	112
Silver Hill, Davidson County, North Carolina.....	169
Silver Hill, Storey County, Nevada.....	101, 105
Silver King, Pinal County, Arizona.....	111, 117, 236
Silver Lead, Mariposa County, California.....	36
Silver Lick, Eureka County, Nevada.....	94
Silver Nugget, Pinal County, Arizona.....	111, 117, 238
Silver Plume, Clear Creek County, Colorado.....	146
Silver Point, Lander County, Nevada.....	98
Silver Star, Plumas County, California.....	74
Silver State, Eureka County, Nevada.....	94
Silver Valley, Davidson County, North Carolina.....	169
Silver Wave, Lake County, Colorado.....	143
Silver Wing, San Juan County, Colorado.....	154
Simpson, Mecklenburg County, North Carolina.....	170
Sinclair Flat, Butte County, California.....	15
Singleton, Lumpkin County, Georgia.....	178
Sitby, Butte County, California.....	17
Sitting Bull, Lawrence County, Dakota.....	162
Skunk Point, Trinity County, California.....	87
Slide, Boulder County, Colorado.....	147
Smith, Siskiyou County, California.....	82
Smuggler, Boulder County, Colorado.....	147
Smuggler, Gunnison County, Colorado.....	150
Sneath and Clay, Nevada County, California.....	55
Snow, El Dorado County, California.....	26
Snowdrift, Clear Creek County, Colorado.....	146
Snowflake, Gunnison County, Colorado.....	150
Solo, Yuba County, California.....	89
Song Bird, Custer County, Colorado.....	147
Sonora, Calaveras County, California.....	22
Sonora, Tuolumne County, California.....	84
Soulsby, Tuolumne County, California.....	85
South Bulwer, Mono County, California.....	44, 238
Southern American, Lemhi County, Idaho.....	124
Southern Cross, Nevada County, California.....	62
Southern Cross, Placer County, California.....	63
Southern Eureka, Placer County, California.....	69
Southern Nevada, Esmeralda County, Nevada.....	92
South Fort, Sierra County, California.....	81
South Hite, Mariposa County, California.....	37
South Idaho, Nevada County, California.....	52
South Spring Hill, Amador County, California.....	12
South Yuba, Nevada County, California.....	59
Spanish Dry Diggings, El Dorado County, California.....	27
Spar, Gunnison County, Colorado.....	150
Spargo, Nevada County, California.....	57
Spaulding, Mono County, California.....	44
Spellier, Plumas County, California.....	69
Sprague, White County, Georgia.....	180
Springfield, El Dorado County, California.....	25
Spring Valley, Butte County, California.....	14, 90, 236
Stafford, White Pine County, Nevada.....	106
Standard Consolidated, Mono County, California.....	39, 90, 236
Standby, Pennington County, Dakota.....	160
Star, White Pine County, Nevada.....	106, 108
Star and Grove, Lander County, Nevada.....	98
Starlight, El Dorado County, California.....	25
Star of the West, Siskiyou County, California.....	82
State Line, Esmeralda County, Nevada.....	93
State Line, Nye County, Nevada.....	100
State Ridge, Mono County, California.....	49
Steamboat, Siskiyou County, California.....	82
Steen & Co., Lake County, Colorado.....	137

	Page.
Stein, Calaveras County, California.....	21
Stevens, Yuba County, California.....	88
Stonewall Jackson, Pinal County, Arizona.....	111, 117
Stormont, Utah County, Utah.....	129, 236
Strawberry, Placer County, California.....	64
Subrosa, Boise County, Idaho.....	123
Succedo, Mariposa County, California.....	37
Success, Nye County, Nevada.....	100
Succor Flat, Placer County, California.....	64
Sultana, Utah County, Utah.....	128
Sumpter, Baker County, Oregon.....	118
Sunday, Utah County, Utah.....	128
Sunny Side, Calaveras County, California.....	22
Sunny South, Sierra County, California.....	81
Sunset, Mono County, California.....	49
Swain, Siskiyou County, California.....	82
Swamp Angel, Nevada County, California.....	61
Sweetland Creek, Nevada County, California.....	61
Syndicate, Mono County, California.....	41

T.

Table Mountain, Calaveras County, California.....	24
Tacou, Alaska.....	168
Talbot, Nevada County, California.....	56
Taylor, Placer County, California.....	65
Taylor and Clark, Nevada County, California.....	62
Tehama, Alturas County, Idaho.....	123
Tempest, Lincoln County, Nevada.....	99
Templar, Yuba County, California.....	89
Tenderfoot, Gunnison County, Colorado.....	150
Terrible, Clear Creek County, Colorado.....	146
Texas Ranger, Gunnison County, Colorado.....	150
Thanksgiving, Esmeralda County, Nevada.....	93
Thistlewaite, Los Angeles County, California.....	31
Thomas, Nevada County, California.....	62
Thompson, Humboldt County, California.....	35
Thompson, Plumas County, California.....	70
Thompson, Siskiyou County, California.....	82
Tidal Wave, Calaveras County, California.....	24
Tiger, Maricopa County, California.....	111, 117
Tilden, Chaffee County, Colorado.....	153
Tilden, Esmeralda County, Nevada.....	93
Time, Gunnison County, Colorado.....	151
Tintic, Utah County, Utah.....	127
Tioga, Mono County, California.....	44, 238
Tip Top, Plumas County, California.....	70
Tip Top, Yavapai County, Arizona.....	116, 117, 238
Toda and Moore, Calaveras County, Colorado.....	21
Tombstone, Pima County, Arizona.....	113, 117, 236
Tom Green, Utah County, Utah.....	128
Tom Lane, Kern County, California.....	31
Tomlinson, Gilpin County, Colorado.....	144
Tom Paine, Baker County, Oregon.....	118
Tom Paine, Calaveras County, California.....	24
Tonto, Utah County, Utah.....	128
Ton Yam, Boise County, Idaho.....	123
Toombs, El Dorado County, California.....	28
Townsend, Pinal County, Arizona.....	112
Tramp, Idaho County, Idaho.....	124
Transcript, Nevada County, California.....	56
Travis, Boise County, Idaho.....	123
Traynor, Gunnison County, Colorado.....	150
Tregay, Boise County, Idaho.....	123
Trinity, Lander County, Nevada.....	98
Trinity, Trinity County, California.....	87
Triumph, Nye County, Nevada.....	99
Trojan, Lawrence County, Dakota.....	162
Troxelle, Sierra County, California.....	78

	Page.
Troy, Lumpkin County, Georgia.....	178
Truckee, Sierra County, California.....	78
True Blue, Tuolumne County, California.....	85
Tulu, Owyhee County, Idaho.....	125
Twenty-six, Custer County, Colorado.....	148
Twin Arrow, Eureka County, Nevada.....	94
Tybo Consolidated, Nye County, Nevada.....	100, 108
Tyger, Elko County, Nevada.....	92

U.

Ullathone, Humboldt County, California.....	35
Unicorn, Clear Creek County, Colorado.....	146
Union, Los Angeles County, California.....	31
Union, Yuba County, California.....	89
Union Consolidated, Sierra County, California.....	77
Union Consolidated, Storey County, Nevada.....	105, 108, 238
Union Gold Bluff, Humboldt County, California.....	35
United Gregory, Gilpin County, Colorado.....	144
University, Mono County, California.....	43
U. S. Grant, Placer County, California.....	66
Utah, Storey County, Nevada.....	101, 105
Utah Consolidated, Utah County, Utah.....	128

V.

Vance's Bar, Trinity County, California.....	87
Vanderbilt, Custer County, Colorado.....	147
Vattain, Ormsby County, Nevada.....	100
Vermillion, Butte County, California.....	18
Vermont, Shasta County, California.....	76
Victor, Esmeralda County, Nevada.....	92
Vide Poche, Gunnison County, Colorado.....	149
Virtue, Baker County, Oregon.....	118
Virginia, Custer County, Colorado.....	148
Virginia, Inyo County, California.....	29
Volcano, Amador County, California.....	13
Von Bremen, Nevada County, California.....	62
Vulcan, Mono County, California.....	47, 90
Vulcan, Nevada County, California.....	53
Vulture, Maricopa County, California.....	111

W.

Wacht am Rhein, Utah County, Utah.....	128
Walkenshaw, Nevada County, California.....	60
Walker and Co., El Dorado County, California.....	26
Wall St., El Dorado County, California.....	27
Ward, El Dorado County, California.....	28
Warrington, Kern County, California.....	31
Washington, Amador County, California.....	14
Washington, Gunnison County, Colorado.....	150
Washington, Mariposa County, California.....	36
Washington, Nevada County, California.....	62
Washington, Union County, North Carolina.....	174
Washington, Yuba County, California.....	89
Washo, Placer County, California.....	64
Washo Consolidated, Esmeralda County, Nevada.....	94
Waterman, Gilpin County, Colorado.....	144
Wathen, Alturas County, Idaho.....	123
Watson and Kester, Yuba County, California.....	89
Watt, Nevada County, California.....	60
Wa Yen, Nevada County, California.....	62
Way Up, Kern County, California.....	31
Weatherbee, Baker County, Oregon.....	118
Weaver Creek, Trinity County, California.....	87
Weaverville, Trinity County, California.....	87
Webfoot, Owyhee County, Idaho.....	125

	Page.
Weed's Point, Yuba County, California	88
Wee Pet, Utah County, Utah	129
West Giant, Eureka County, Nevada	96
Wheal Jane, Nevada County, California	56
Wheatfields, Pinal County, Arizona	112
Wheeler, Amador County, California	14
Wheeler, Gilpin County, Colorado	144
Whippoorwill, Eureka County, Nevada	96
Whiskey Gulch, Owyhee County, Idaho	125
Whiskey Slide, Calaveras County, California	20
Whitcomb, Gilpin County, Colorado	144
White Cloud, Alturas County, Idaho	123
White, Lander County, Nevada	98
White, Shasta County, California	75
White, Lumpkin County, Georgia	178
White and Kaly, Boise County, Idaho	123
Whitman, Inyo County, California	29
Widder, Humboldt County, California	35
Wide Awake, Plumas County, California	70
Wide West, Nevada County, California	62
Wild Dutchman, Utah County, Utah	129
Wild Horse, Gunnison County, Colorado	150
Williams, Eureka County, Nevada	96
Williams, Gilpin County, Colorado	145
Williams, Shasta County, California	75
Williams, Yuba County, California	88
Williamsburg, Eureka County, Nevada	96
Williamson, Nevada County, California	62
Wilson's, Lander County, Nevada	98
Wind Up, Nevada County, California	59
Winner, Placer County, California	66
Wisconsin, Sierra County, California	81
Wisconsin Extension, Sierra County, California	81
Wonder, Esmeralda County, Nevada	93
Wonder, San Bernardino County, California	33
Wong Fuey, Shasta County, California	75
Worthley & Co., Nevada County, California	59
Wright Q., Amador County, California	14
Wright, Humboldt County, Nevada	97
Wyandotte, Butte County, California	15

Y.

Yadkin, Rowan County, North Carolina	169
Yankee Jim, Placer County, California	64
Yellow Jacket, Storey County, Nevada	105, 236
Yip Kee, Boise County, Idaho	123
Yo Semite, Mariposa County, California	36
Yo Semite, Mono County, California	49
Young America, White Pine County, Nevada	106, 108
Young and Sirlott, Lyon County, Nevada	99
Yuma Mill, San Diego County, California	34

Z.

Zeila, Amador County, California	13
Zillah, Clear Creek County, Colorado	146
Zimmerman and Wagstem, Sacramento County, California	32
Zulu, Eureka County, Nevada	94, 96

INDEX OF LOCALITIES.

A.

	Page.
Abbeville County, South Carolina	177
Ada County, Idaho	122
Adin, Modoc County, California	34
Alaska	167
Albany Flat, Calaveras County, California	19
Allegheny, Sierra County, California	81
Allison Ranch, Nevada County, California	54
Alpine County, California	11
Alturas County, Idaho	123
Alturas, Plumas County, California	67
Amador County, California	12
American Fork, Utah County, Utah	128
Anaheim, Los Angeles County, California	31
Angels, Calaveras County, California	19
Aninas Valley, Colorado	155
Arivaca, Pima County, Arizona	112
Arizona	109
Aspen City, Gunnison County, Colorado	150
Auburn, Placer County, California	62, 64
Aurora, Esmeralda County, Nevada	93
Austin, Lander County, Nevada	97

B.

Badger Flat, Inyo County, California	30
Baker County, Oregon	118
Bakersfield, Kern County, California	31
Baker Ranch, Nevada County, California	61
Balarat, Boulder County, Colorado	147
Bald Hill, Calaveras County, California	22
Bald Mountain, Lawrence County, Dakota	162, 166
Baltimore Ravine, Placer County, California	65
Banner District, Boise County, Idaho	123
Banner District, San Diego County, California	34
Bath, Placer County, California	66
Battle Mountain, Summit County, Colorado	152
Bay Horse, Lemhi County, Idaho	124
Bear, Lawrence County, Dakota	162
Bear Valley, Mariposa County, California	37
Beaver, Lawrence County, Dakota	162
Beaverhead County, Montana	126
Benton, Esmeralda County, Nevada	93
Benton, Mono County, California	47
Benton County, Oregon	118
Betsy Gulch, Plumas County, California	71
Beveridge, Inyo County, California	29
Big Bar, Trinity County, California	87
Big Cañon, El Dorado County, California	25
Big Flat, Napa County, California	36
Big Indian Bar, Butte County, California	17
Big Oaks Flat, Tuolumne County, California	85
Black Bear, Siskiyou County, California	82
Black Creek, Cassia County, Idaho	124
Black Hills, Dakota	159

Blanco, Pima County, Arizona	112
Blue Cañon, Placer County, California	66
Blue Tint, Nevada County, California	61
Bodie, Mono County, California	38
Boise County, Idaho	123
Boulder County, Colorado	147
Brackettown, North Carolina	171
Brandy City, Sierra County, California	80
Breckenridge, Summit County, Colorado	152
Brindletown, North Carolina	171
Brisbee, Pima County, Arizona	112
Bristol, Lincoln County, Nevada	98
Brown County, Indiana	181
Brownsville, Yuba County, California	89
Buckskin, Park County, Colorado	148
Buena Vista, Chaffee County, Colorado	153
Bullards Bar, Yuba County, California	89
Bully Choop, Shasta County, California	74
Buncombe County, North Carolina	171
Burke County, North Carolina	171
Burnt Ranch, Trinity County, California	87
Butte, Montana	126
Butte City, Amador County, California	14
Butte County, California	14
Butte Meadows, Tehama County, California	34

C.

Cabarrus County, North Carolina	170
Calaveras County, California	18
Calaveritas, Calaveras County, California	19
Caldwell County, North Carolina	171
Camptonville, Yuba County, California	88
Candalaria, Esmeralda County, Nevada	92
Caribou, Boulder County, Colorado	147
Cassia County, Idaho	124
Castle Downe, Yuma County, Arizona	116
Catawba County, North Carolina	171
Cerbat, Mohave County, Arizona	110
Cerro Gordo, Inyo County, California	29
Chaffee City, Chaffee County, Colorado	153
Chaffee County, Colorado	153
Chalk Creek, Chaffee County, Colorado	153
Challis, Lemhi County, Idaho	124
Cherry Creek, White Pine County, Nevada	106
Chesterfield County, South Carolina	176
Chihuahua, Summit County, Colorado	152
Chilcat River, Alaska	167
Chile Gulch, Calaveras County, California	19
Chile Hill, Calaveras County, California	19
China Flat, Humboldt County, California	35
Choteau County, Montana	126
Cisco, Placer County, California	66
Classic City, Napa County, California	36
Clear Creek County, Colorado	145
Cochetopa, Gunnison County, Colorado	149
Coffee Creek, Trinity County, California	86
Colfax, Placer County, California	66
Coloma, El Dorado County, California	26
Colton, San Bernardino County, California	32
Columbia, Nevada County, California	51
Columbia, Tuolumne County, California	84
Columbus, Esmeralda County, Nevada	92
Colusa County, California	35
Conejos County, Colorado	153
Cortez, Eureka County, Nevada	94
Cornucopia, Elko County, Nevada	92
Cottonwood, Chaffee County, Colorado	153
Cottonwood, San Bernardino County, California	32

	Page.
Coulterville, Mariposa County, California.....	36
Crescent Mills, Plumas County, California.....	72
Crested Butte, Gunnison County, Colorado.....	149
Crooked River, Boise County, Idaho.....	123
Custer County, Colorado.....	147
Custer County, Dakota.....	160
Custer County, Montana.....	126

D.

Dakota.....	159
Damascus, Placer County, California.....	64
Darwin, Inyo County, California.....	28
Davidson County, North Carolina.....	169
Dawson County, Georgia.....	180
Dayton, Lyon County, Nevada.....	99
Deadwood, Trinity County, California.....	87
Deep Spring, Inyo County, California.....	29
Deer Cañon, Tulare County, California.....	83
Deer Creek, Nevada County, California.....	56
Deer Lodge County, Montana.....	126
Del Norte County, Colorado.....	35
Diamond Mountain, Lassen County, California.....	34
Diamond Springs, El Dorado County, California.....	26
Dogtown, Calaveras County, California.....	19
Don Cabezas, Pima County, Arizona.....	112
Douglas City, Trinity County, California.....	88
Douglas Flat, Calaveras County, California.....	22
Douglas and Murphy's, Calaveras County, California.....	19
Downieville, Nye County, Nevada.....	99
Downieville, Sierra County, California.....	79
Dragoon, Pima County, Arizona.....	112
Dry Lake, San Bernardino County, California.....	32
Drytown, Amador County, California.....	13
Duck Creek, Lander County, Nevada.....	98
Duncan Hill, Placer County, California.....	65
Dun Glen, Humboldt County, Nevada.....	97
Dutch Flat, Placer County, California.....	63
Dysartsville, North Carolina.....	171

E.

Eagle Gulch, Plumas County, California.....	71
Eagle River, Summit County, Colorado.....	152
El Dorado Cañon, Lincoln County, Nevada.....	99
El Dorado County, California.....	24
El Dorado, El Dorado County, California.....	25
Elizabethtown, Plumas County, California.....	70
Elk Mountain, Gunnison County, Colorado.....	151
Elko County, Nevada.....	91
Ellenberg, Yakima County, Washington.....	121
Ellsworth, Nye County, Nevada.....	99
El Rio, San Diego County, California.....	34
Emigrant Gap, Placer County, California.....	66
Esmeralda County, Nevada.....	92
Estes Mountain, Lemhi County, Idaho.....	124
Etna, Siskiyou County, California.....	82
Euchre Cañon, Placer County, California.....	64
Eureka County, Nevada.....	94
Eureka, Eureka County, Nevada.....	94

F.

Fine Gold Gulch, Fresno County, California.....	34
Fir Leaf, Sierra County, California.....	80
Flyaway Gulch, Mariposa County, California.....	37
Folsom, Sacramento County, California.....	32
Forbes Gulch, Butte County, California.....	18

	Page.
Forest City, Chaffee County, Colorado.....	153
Forest City, Sierra County, California.....	80, 81
Forest Hill, Placer County, California.....	64
Fort Jones, Siskiyou County, California.....	82
Four Mile Run, Chaffee County, Colorado.....	153
Fourth Crossing, Calaveras County, California.....	19
French Corral, Nevada County, California.....	61
French Gulch, Shasta County, California.....	74
Fresno County, California.....	34
Fresno, Fresno County, California.....	34

G.

Gainesville, Georgia.....	180
Galena, Lander County, Nevada.....	98
Galena, Lawrence County, Dakota.....	162
Gallatin County, Montana.....	126
Garfield, Chaffee County, Colorado.....	153
Gaston County, North Carolina.....	171
Geauga County, Indiana.....	181
Georgetown, Clear Creek County, Colorado.....	146
Georgetown, El Dorado County, California.....	27
Georgia.....	177
Gibbonville, Lemhi County, Idaho.....	124
Gibsonville, Sierra County, California.....	76
Gilpin County, Colorado.....	133, 143
Glacier Creek, Alaska.....	167
Glencoe, Calaveras County, California.....	23
Glendale, Montana.....	126
Globe, Pinal County, Arizona.....	111
Gold Creek, Alaska.....	167
Golden City, Tuolumne County, California.....	86
Gold Flat, Nevada County, California.....	56
Gold Hill, Boulder County, Colorado.....	147
Gold Lake, Sierra County, California.....	78
Gold Mountain, Esmeralda County, Nevada.....	93
Goodyear's Bar, Sierra County, California.....	80
Goose Lake, Plumas County, California.....	67
Gothic, Gunnison County, Colorado.....	149
Granite Basin, Plumas County, California.....	72, 73
Granite Creek, Grant County, Oregon.....	118
Grant County, Oregon.....	119
Grantsville, Nye County, Nevada.....	99
Grass Valley, Nevada County, California.....	51
Greenville, Plumas County, California.....	67
Greenville, South Carolina.....	177
Greenwood, El Dorado County, California.....	26
Grizzly Flat, El Dorado County, California.....	27
Groveland, Tuolumne County, California.....	85
Guilford County, North Carolina.....	169
Gunnison County, Colorado.....	149
Gunnison, Gunnison County, Colorado.....	149

H.

Hahn's Cañon, Inyo County, California.....	29
Hancock, Chaffee County, Colorado.....	153
Hapland, Mendocino County, California.....	33
Happy Camp, Napa County, California.....	36
Harris, Alaska.....	167
Harshaw, Pima County, Arizona.....	112
Havilah, Kern County, California.....	31
Hayward, Pennington County, Dakota.....	161, 166
Hiko, Lincoln County, Nevada.....	99
Hillerton, Gunnison County, Colorado.....	149
Hinsdale County, Colorado.....	153
Hite's Cove, Mariposa County, California.....	36
Holland, Pima County, Arizona.....	112
Homer District, Mono County, California.....	48

	Page.
Honey Lake, Plumas County, California	67
Hoosier Bar, El Dorado County, California	28
Hornitas, Mariposa County, California	36
Horsetown, Shasta County, California	75
Howland Flat, Sierra County, California	77
Humboldt County, California	35
Humboldt County, Nevada	96
Humbug Cañon, Placer County, California	64
Hunter's Valley, Mariposa County, California	38

I.

Idaho County, Idaho	124
Idaho Springs, Clear Creek County, Colorado	146
Illinois Gulch, Gilpin County, Colorado	145
Independence, Inyo County, California	29
Indiana	181
Indian Valley, Plumas County, California	67
Inyo County, California	28
Ione, Amador County, California	14
Iowa Bar, Oneida County, Idaho	124
Iowa Hill, Placer County, California	64
Iron Mountain, Shasta County, California	75
Irwin, Gunnison County, Colorado	149

J.

Jackson, Amador County, California	13
Jackson County, Oregon	119
Jamestown, North Carolina	171
Jamestown, Tuolumne County, California	85
Jefferson County, Montana	126
Jennison, Plumas County, California	67
Jenny Lind, Calaveras County, California	24
Jim Crow Cañon, Sierra County, California	80
Julian, San Diego County, California	34
Junction City, Trinity County, California	88
Jut Cañon, Nye County, Nevada	99

K.

Kern County, California	31
Kinnikinnick, Alturas County, Idaho	123
Kokomo, Summit County, Colorado	152
Klamath Mills, Siskiyou County, California	82
Klamath River, Humboldt County, California	35

L.

La Grange, Stanislaus County, California	32
Lake County, Colorado	134
Lake District, Mono County, California	48
Lake Gulch, Gilpin County, Colorado	145
Lancaster County, South Carolina	176
Lancha Plana, Amador County, California	14
Lander County, Nevada	97
Lane County, Oregon	119
La Plata County, Colorado	153
La Porte, Plumas County, California	72
Lassen County, California	34
Latrobe, El Dorado County, California	28
Lawrence County, Dakota	161
Lawton, Clear Creek County, Colorado	145
Lead City, Dakota	166
Leadville, Lake County, Colorado	133, 135, 138, 140
Leavenworth Gulch, Gilpin County, Colorado	145
Lemhi County, Idaho	124
Lewis and Clarke County, Montana	126

Lewiston, Trinity County, California	87
Lexington, North Carolina	169
Lida Valley, Esmeralda County, Nevada	93
Lincoln County, Nevada	98
Lincoln, Placer County, California	66
Little Grass Valley, Nevada County, California	60
Lodi, Nye County, Nevada	99
Long Valley, Plumas County, California	67
Lowell Hill, Nevada County, California	61
Lumpkin County, Georgia	180
Lyon County, Nevada	99

M.

McDowell County, North Carolina	171
Maderi, Fresno County, California	34
Madison County, Montana	126
Magalia, Butte County, California	17
Magnolia, Boulder County, Colorado	147
Maine	180
Mallory Gulch, Lawrence County, Dakota	162
Mammoth Bar, El Dorado County, California	28
Mammoth City, Mono County, California	47
Maricopa County, Arizona	111
Mariposa County, California	36
Markleeville, Alpine County, California	11
Mazourka Cañon, Inyo County, California	30
Meadow Lake, Nevada County, California	61
Meadow Valley, Plumas County, California	71
Meagher County, Montana	126
Mecklenburg County, North Carolina	170
Mendocino County, California	33
Merced County, California	33
Metallic City, Esmeralda County, Nevada	92
Michigan Bar, Sacramento County, California	32
Michigan Bluff, Placer County, California	64
Milton, Calaveras County, California	24
Mineral Creek, Humboldt County, Nevada	97
Mineral Creek, Pinal County, Arizona	111
Mineral Hill, Alturas County, Idaho	123
Mineral Hill, Elko County, Nevada	92
Mineral King, Tulare County, California	83
Mineral Park, Mohave County, Arizona	110
Missoula County, Montana	126
Modoc County, California	34
Mohave County, Arizona	110
Mohave, San Bernardino County, California	33
Mokelumne Hill, Calaveras County, California	19
Monarch, Chaffee County, Colorado	153
Monitor, Alpine County, California	11
Mono County, California	38
Montana	125
Montezuma, Esmeraldo County, Nevada	93
Montezuma, Summit County, Colorado	152
Montgomery County, North Carolina	174
Moore County, North Carolina	174
Moore's Flat, Nevada County, California	61
Morey, Nye County, Nevada	99
Morgan County, Indiana	181
Morris Flat, Nevada County, California	62
Moscow, Nez Perces County, Idaho	124
Mosquito, Calaveras County, California	23
Mosquito, Park County, Colorado	148
Mount Bross, Park County, Colorado	148
Mount Cory, Mono County, California	50
Mount Grant, Esmeralda County, Nevada	93
Mount Lincoln, Park County, Colorado	148
Mount Pleasant, Cabarrus County, North Carolina	170
Murphy's, Calaveras County, California	22

N.

	Page.
Napa County, California.....	33
Nash County, North Carolina.....	175
Negro Creek, Yakima County, Washington.....	121
Nevada.....	91
Nevada County, California.....	51
Nevada City, Nevada County, California.....	56
New Castle, Placer County, California.....	65
New Mexico.....	158
Newton, El Dorado County, California.....	26
Nez Perces County, Idaho.....	124
Nigger Gulch, Lawrence County, Idaho.....	162
Nimeshaw, Butte County, California.....	18
North Bloomfield, Nevada County, California.....	60
North Branch, Calaveras County, California.....	24
North Carolina.....	169
North San Juan, Nevada County, California.....	60
Northumberland, Nye County, Nevada.....	99
Nye County, Nevada.....	99

O.

Oak Valley, Yuba County, California.....	88
Ohio City, Gunnison County, Colorado.....	150
Okana, Humboldt County, Nevada.....	97
Oleta, Amador County, California.....	13
Omega, Nevada County, California.....	59
Oneida County, Idaho.....	124
Ophir, Placer County, California.....	66
Ophir Cañon, Nye County, Nevada.....	99
Oregon.....	117
Oregon Gulch, Butte County, California.....	16
Oregon House, Yuba County, California.....	89
Orleans Bar, Humboldt County, California.....	35
Ormsby County, Nevada.....	100
Oro, Pima County, Arizona.....	112
Oro Fino, Siskiyou County, California.....	82
Oroville, Butte County, California.....	15
Ouray County, Colorado.....	153
Owyhee County, Idaho.....	125

P.

Paradise, Humboldt County, Nevada.....	97
Park County, Colorado.....	148
Patagonia, Pima County, Arizona.....	112
Pennington County, Dakota.....	160
Peshastin, Yakima County, Washington.....	121
Petersburg, Gunnison County, Colorado.....	151
Philadelphia, Nye County, Nevada.....	100
Phillipsburg, Deer Lodge County, Montana.....	126
Pike City, Sierra County, California.....	81
Pima County, Arizona.....	112
Pinal County, Arizona.....	111
Pine Grove, Esmeralda County, Nevada.....	93
Pino, Placer County, California.....	66
Pioche, Lincoln County, Nevada.....	98
Pioneer, Amador County, California.....	13
Pioneer, Pinal County, Arizona.....	111
Pitkin, Gunnison County, Colorado.....	149
Placer County, California.....	62
Placerville, El Dorado County, California.....	24
Pleasant Valley, Amador County, California.....	13
Plumas County, California.....	67
Plymouth, Amador County, California.....	13
Poker Flat, Sierra County, California.....	78
Polk County, North Carolina.....	175

	Page.
Poncha Springs, Chaffee County, Colorado.....	153
Poorman's Gulch, Lawrence County, Dakota.....	161
Portwine, Sierra County, California.....	77
Potato Gulch, Lawrence County, Dakota.....	162
Poverty Hill, Sierra County, California.....	80
Prattville, Plumas County, California.....	69
Providence, Boulder County, Colorado.....	147

Q.

Quartzburg, Boise County, Idaho.....	123
Quincy, Plumas County, California.....	67, 69

R.

Rattlesnake Bar, Placer County, California.....	66
Ravenna, Los Angeles County, California.....	31
Rebel Creek, Humboldt County, Nevada.....	97
Red Cliff, Summit County, Colorado.....	152
Red Hill, Calaveras County, California.....	19
Red Hill, Trinity County, California.....	88
Red Mountains, Elko County, Nevada.....	91
Rhode Island Ravine, Nevada County, California.....	54
Richmond Basin, Pinal County, Arizona.....	111
Rio Grande County, Colorado.....	153
Riverside, San Bernardino County, California.....	33
Roaring Fork, Gunnison County, Colorado.....	150
Robinson's Ferry, Calaveras County, California.....	22
Rockerville, Pennington County, Dakota.....	161
Rockford, Pennington County, Dakota.....	161, 166
Rockland, Esmeralda County, Nevada.....	93
Rosita, Custer County, Colorado.....	148
Rough and Ready, Nevada County, California.....	59
Rowan County, North Carolina.....	169
Ruby, Gunnison County, Colorado.....	150
Rugby Creek, Whatcom County, Washington.....	121
Russell Gulch, Gilpin County, Colorado.....	145
Rutherford County, North Carolina.....	171
Rye Valley, Baker County, Oregon.....	118

S.

Sacramento County, California.....	32
Saint Louis, Sierra County, California.....	78
Salina, Boulder County, Colorado.....	147
Salisbury, Rowan County, North Carolina.....	169
Salmon Creek, Alaska.....	167
Salmon Falls, Alturas County, Idaho.....	123
Sampson Flat, Fresno County, California.....	34
San Antone, Calaveras County, California.....	19
San Bernardino County, California.....	32
San Bernardino Cañon, San Bernardino County, California.....	33
San Diego County, California.....	34
San Jacinto, San Bernardino County, California.....	33
San Juan Country, Colorado.....	153
San Juan County, Colorado.....	153
San Xavier, Pima County, Arizona.....	112
Sawyer's Bar, Siskiyou County, California.....	82
Scott's Flat, Nevada County, California.....	59
Secret Town, Placer County, California.....	63
Sehug Creek, Alaska.....	167
Shady Run, Placer County, California.....	66
Shasta County, California.....	74
Shasta, Shasta County, California.....	75
Sheep Creek, Alaska.....	167
Shingle Springs, El Dorado County, California.....	26
Sierra County, California.....	76
Sierra City, Sierra County, California.....	81

	Page.
Signal, Mohave County, Arizona.....	110
Silverado, Los Angeles County, California.....	31
Silver City, Lyon County, Nevada.....	99
Silver City, Owyhee County, Idaho.....	125
Silver Cliff, Custer County, Colorado.....	143
Silver Creek, Montana.....	126
Silver Hill, Mono County, California.....	40
Silver District, Yuma County, Arizona.....	116
Silver Peak, Esmeralda County, Nevada.....	93
Siskiyou County, California.....	82
Sitka, Alaska.....	167
Six Mile Creek, Siskiyou County, California.....	82
Skagit River, Washington.....	121
Sly Creek, Yuba County, California.....	89
Stuartsville, Yuba County, California.....	88
Smiday Peak, Tulare County, California.....	83
Smith's Flat, Calaveras County, California.....	22
Snake River, Alturas County, Idaho.....	123
Snake River, Summit County, Colorado.....	152
Snow Point, Nevada County, California.....	62
Sonora, Tuolumne County, California.....	84
Soulsbyville, Tuolumne County, California.....	85
South Carolina.....	176
South Gold Run, Lawrence County, Dakota.....	161
Spanish Belt, Nye County, Nevada.....	100
Spanish Ranch, Plumas County, California.....	71
Spartanburg, South Carolina.....	177
Spruce Creek, Alaska.....	167
Spruce Gulch, Lawrence County, Dakota.....	162, 166
Stanislaus County, California.....	32
Stanley Basin, Boise County, Idaho.....	123
Stanly County, North Carolina.....	174
Star District, Humboldt County, Nevada.....	97
Stevens, Clear Creek County, Colorado.....	145
Stockton Hill, Calaveras County, California.....	19
Storey County, Nevada.....	101
Strawberry, Lawrence County, Dakota.....	162, 166
Sulphur Creek, Colusa County, California.....	35
Summit City, Alpine County, California.....	12
Summit County, Colorado.....	133, 152
Sunshine, Boulder County, Colorado.....	147
Susanville, Plumas County, California.....	67
Swansea, Inyo County, California.....	29
Sweettard, Nevada County, California.....	61

T.

Tacopa, Los Angeles County, California.....	31
Tacon River, Alaska.....	167
Tarrytown, Mono County, California.....	50
Taylor's Flat, Trinity County, California.....	87
Taylorville, Plumas County, California.....	69
Tehama County, California.....	34
Telegraph City, Calaveras County, California.....	23
Telluride, Boulder County, Colorado.....	147
Tem-pah-Ute, Lincoln County, Nevada.....	99
Temperance Creek, Mariposa County, California.....	38
Ten Mile, Summit County, Colorado.....	152
Terraville, Dakota.....	166
Thomasville, Davidson County, North Carolina.....	169
Tigerville, Dakota.....	166
Tioga, Mariposa County, California.....	37
Tombstone, Pima County, Arizona.....	112
Trinidad, Humboldt County, California.....	35
Trinity Centre, Trinity County, California.....	86
Trinity River, Humboldt County, California.....	35
Tulare County, California.....	83
Tuolumne County, California.....	83
Tuscarora, Elko County, Nevada.....	92

	Page.
Tuttletown, Tuolumne County, California.....	86
Tybo, Nye County, Nevada	100

U.

Umatilla County, Oregon.....	119
Union County, North Carolina.....	174
Union County, Oregon	119
Union District, Nye County, Nevada	99
Unionville, Humboldt County, Nevada	97
Utah	127

V.

Vallecitos, Calaveras County, California	19
Ventura County, California.....	34
Virginia City, Gunnison County, Colorado	149
Volcano, Amador County, California.....	12

W.

Walla Walla, Walla Walla County, Washington.....	121
Walla Walla County, Washington	121
Ward District, White Pine County, Nevada	106
Warrens, Idaho County, Idaho	124
Washington, Idaho County, Idaho	124
Washington, Nevada County, California	59
Washington, Pima County, Arizona	112
Washoe County, Nevada.....	106
Washton, Pima County, Arizona	112
Watauga County, North Carolina.....	171
Weaversville, Trinity County, California.....	87
West Point, Calaveras County, California	23
Whateome County, Washington	121
Wheatland, Yuba County, California	89
Whiskey Diggings, Sierra County, California	76
White County, Georgia	180
White Pine County, Nevada.....	106
White Pine, Tulare County, California	83
White River, Kern County, California	31
Whitesides, North Carolina.....	171
Whitman, Whateome County, Washington.....	121
Wickes, Montana	126
Willow Creek, Humboldt County, California	35
Windham, Alaska.....	167
Winnemucca, Humboldt County, Nevada	97
Wood's Creek, Tuolumne County, California.....	86
Woolsey's Flat, Nevada County, California.....	62

Y.

Yakima County, Washington	121
Yankee Fork, Lemhi County, California	124
Yankee Hill, Butte County, California	17
Yankee Jim's, Placer County, California.....	64
Yavapai County, Arizona.....	116
York County, South Carolina.....	177
York Bet, Nevada County, California	61
Yreka, Siskiyou County, California	82
Yuma County, Arizona	116
Yuba County, California	88

GENERAL INDEX OF SUBJECTS.

A.

	Page.
Activity displayed in the development of Dakota mines	166
Actual cost of Bonanza mines	103
Ada County, Idaho, condition of the mines in	122
Advantages of the leaching process over amalgamation	334
African states, monetary statistics of	245
Air and water compared in dry and wet crushing	372
Air compressor and rock drill, Richmann's	347
Alaska, amount of water available for mining in	168
Alaska as a mining region	167
Alaska, its ledges	167
Alice Mine, Utah, description of	131
Alluvial placers	325
Alpine County, California, condition of mines in	11
Alturas County, Idaho, condition of mines in	123
Amador County, California, condition of mines in	12
Amalgamating plates compared	338
Amalgamating, pulverizing, and crushing pan combined	349
American arrastra, Paul's	347
American Fork mines, Utah, development of	128
Amount of bullion, and the locality of its production, handled by bankers during the fiscal year 1880	186
Amount of bullion produced by the principal reduction works	187
Amount of bullion shipped by express as reported	187
Amount of bullion transported by the Central Pacific, Atchison, Topeka and Santa Fé, and Virginia and Truckee Railroads during 1880	186
Amount of gold and silver deposited at the mints and assay offices from Dakota	166
Amount of gold and silver ore and bullion shipped by the Central Pacific Rail- road from Arizona	189
Amount of gold and silver ore and bullion shipped by the Central Pacific Rail- road from California	188
Amount of gold and silver ore and bullion shipped by the Central Pacific Rail- road from Nevada	189
Amount of gold and silver ore and bullion shipped by the Central Pacific Rail- road from Utah	190
Amount of ore on hand at the various reduction works in Leadville January 1, 1881	139
Amount of precious metals produced in the States and Territories west of the Missouri River during 1880	182
Analysis of beach sands	331
Ancient river system of California	377
Annual consumption of gold and silver in the United States, 1874 to 1879	203
Annual consumption of United States coin, &c., in the arts and manufactures, 1879	209
Annual export of silver to India and China	298
Apache disorders in Arizona	110
Appalachian Range, mines of	168
Argentiferous lead ores and their treatment in Utah	352
Argentiferous ore from Bodie	38
Argentiferous ores of Utah, varieties of	352
Arizona, condition of mining industries in	109
Arizona mines, assessments on	233
Arizona, production by counties	116
Assessments and dividends of mining companies	227
Assessments on Arizona mines	233

Assessments on Nevada mines.....	232
Assessments on Utah mines.....	233
Assessment roll of 1880	231
Assessor's statement of the yield of the mines of Eureka County, Nevada.....	96
Auditor's statement of Lyon County, Nevada	107
Auriferous area of Georgia	177
Auriferous gravel, a theory of its formation	376
Auriferous gravel of North Carolina.....	173
Australia, monetary statistics of	239
Austria, monetary statistics of	241
Average annual production of the precious metals in the world.....	295
Average and comparative prices of the principal domestic commodities exported from the United States.....	224
Average daily output of ore from Leadville.....	136
Average value of the principal domestic commodities exported from the United States	219

B.

Baker County, Oregon, condition of the mines in	118
Bald Mountain Mining Company, Sierra County, California, operations of....	324
Bar and river mining.....	327
Bars made at the New York assay office for use in the arts and manufactures..	206
Base bullion in Oregon	119
Beach sands	330
Benton County, Oregon, condition of the mines in	118
Black Hills of Dakota	159
Black Hills as a mining region	160
Blanding's combined crushing, pulverizing, and amalgamating pan	349
Blatchly ore concentrator	350
Bodie, bullion shipments from, 1878 to 1880.....	46
Bodie, character of ore from	38
Bodie electrum	315
Bodie mines, good condition of	50
Boise County, Idaho, condition of mines in	123
Bonanza mines of Nevada	91
Boston and Colorado Smelting Works, shipments from, during 1880	183
Boulder County, Colorado, condition of mines in	147
Brewer mine, South Carolina, description of	176
Bullion production reported by mines in Arizona	117
Bullion production of California by counties	89
Bullion production by the principal mines of Colorado	158
Bullion production by some of the mines of Dakota	167
Bullion production of Idaho by counties.....	125
Bullion production of Nevada by counties	107
Bullion production of the mines of Nevada	108
Bullion production of Oregon by counties	120
Bullion production of the mines of Utah	129
Bullion produced by the Contention Mill, Arizona.....	113
Bullion produced by Leadville smelters	136
Bullion shipments from Central City, Gilpin County, Colorado.....	143
Bullion shipments from Colorado by express	158
Bullion shipments from Leadville for October	138
Bullion shipments from Nevada City, Nevada County, California.....	58
Bullion shipments from North Carolina	175
Bullion tax, Storey County, Nevada	104
Bullion yield of the Bonanza mines for 1880	103
Bunker Hill mine, Amador County, California, how operated	330
Business done by the Boston and Colorado Golden and Moore Smelting Works in 1880	183
Butte County, California, condition of the mines of.....	14
Butte district, Montana, yield of.....	126

C.

Calaveras County, California, condition of the mines of.....	18
California geology, a contribution to.....	374
California, present production in	11

	Page.
California, production of by counties.....	89
Canada, monetary statistics of.....	240
Carbonate Camp, product of, for 15 months ending April 1, 1881.....	137
Carbonates, discovery of, in Gunnison County, Colorado.....	151
Cassia County, Idaho, condition of the mines of.....	124
Central America, monetary statistics of.....	243
Chaffee County, Colorado, condition of the mines of.....	153
Chaffee County, Colorado, description of the mines of.....	153
Chemistry of the smelting process.....	353
Chinese in Gilpin County, Colorado.....	145
Chlorination of ores, Mear's process.....	340
Chlorination of ores, Plattner's process.....	340
Chlorination process in Dakota.....	164
Chlorination works at Merrifield mine, Nevada County, California.....	57
Circular estimating and proclaiming the value of standard coins of foreign countries.....	226
Circulation of various countries.....	309
Clear Creek County, Colorado, condition of the mines of.....	145
Clear Creek County, Colorado, description of some of the mines of.....	146
Clear Creek County, Colorado, production of.....	145
Clifton, Arizona, copper mines at.....	110
Coal mining in Washington Territory.....	120
Coin circulation of the United States.....	215
Coin circulation of the United States at the close of the calendar year 1880.....	216
Coinage during the fiscal year 1880.....	203
Coinage during the calendar year 1880.....	209
Coinage during the calendar years 1877 to 1880.....	210
Coinage of various countries.....	307
Coinage in England.....	307
Colorado, condition of the mining industry in.....	132
Colorado, the mines and mills of.....	132
Colorado, total production of bullion of, for the year.....	132
Colusa County, California, condition of the mines of.....	35
Comparison of shipments of bullion from Bodie.....	47
Comparative currency prices of articles of exportation.....	221
Comparative statement of Leadville production of September with previous months.....	159
Comstock pay-rolls for January, 1881.....	105
Consumption of gold and silver in the arts and manufactures in 1879.....	202
Consumption of the precious metals.....	205
Continuous discharge crushing and grinding pan, Steiger & Kerr's.....	351
Contribution to California geology.....	374
Copper mines at Clifton, Arizona.....	110
Cornish rollers for breaking ore.....	369
Cost of smelting in Utah.....	355
Counties of Arizona.....	110
Course of prices.....	217
Cranston's hydraulic elevators.....	326
Crushing and grinding mill, Redstone's.....	351
Crystal mine of Gunnison County, Colorado, description of.....	151
Crystallization of the sulphate of silver.....	359
Cuba and Hayti, monetary statistics of.....	244
Custer County, Colorado, condition of the mines of.....	147

D.

Daily output of the mines of Leadville.....	143
Dakota, condition of the mining industry in.....	159
Dakota, shipments from, of bullion by express.....	163
Decomposition of sulphate of silver by sulphate of iron.....	360
Decrease in the production of the Bonanza mines of Nevada.....	91
Deep placer mining.....	315
Del Norte County, Colorado, condition of the mines of.....	35
Deposits and purchases of gold and silver bullion at the mints and assay offices during the fiscal year 1879.....	194
Deposits and purchases of gold and silver bullion at the mints and assay offices during the fiscal year 1880.....	197
Deposits of gold of domestic production during the fiscal year 1879.....	195
Deposits of silver of domestic production during the fiscal year 1879.....	196

	Page.
Deposits of gold of domestic production during the fiscal year 1880.....	198
Deposits of silver of domestic production during the fiscal year 1880.....	199
Deposits and purchases of gold and silver during the calendar year 1880....	200
Deposits of gold of domestic production during the calendar year 1880.....	200
Deposits of silver of domestic production during the calendar year 1880.....	201
Deposits at the mints of bullion from Dakota.....	166
Depth of shaft sunk during the year on the Tombstone mine, Arizona.....	113
Depth of workings in the principal mines on the Comstock.....	105
Description of some of the mines of Clear Creek County, Colorado.....	146
Description of some of the mines of Park County, Colorado.....	148
Description of some of the mines of Gunnison County, Colorado.....	149
Description of some of the mines of Chaffee County, Colorado.....	153
Description of some of the mines of Summit County, Colorado.....	152
Description of some of the mines in North Carolina.....	169
Description of the mills used in Georgia.....	178
Destination of ore and base bullion shipped via Central Pacific Railroad.....	190
Development of the Green Mountain mine, Plumas County, California.....	67
Disbursements of the Bonanza mines for 1880.....	102
Discovery of carbonates in Gunnison County, Colorado.....	151
Discovery of gold, first, in Colorado.....	132
Discovery of gold, first, in Georgia.....	177
Dispatches from the United States legation (or consulate) respecting the monetary condition of—	
The Argentine Republic.....	289
Australia.....	246
Austria.....	269
Canada.....	257
Central America.....	237
Cuba.....	291
Denmark.....	273
France.....	262
Germany.....	258
Great Britain.....	245
India.....	253
Italy.....	265
Mexico.....	234
The Netherlands.....	272
Peru.....	238
Portugal.....	277
Russia.....	279
Sweden and Norway.....	274
Switzerland.....	268
Turkey.....	282
Venezuela.....	290
Disposition of the domestic production of gold and silver.....	201
Disposition of the silver production.....	7
Disposition made of the gold and silver deposited at the mints and assay offices.....	214
Ditch at Coloma, El Dorado County, California.....	26
Dividends and assessments of mining companies.....	227
Dividends for the half year.....	231
Dividends from Ophir mines.....	234
Dividends on California and Consolidated Virginia.....	234
Dividends on Leadville mines.....	140
Dividends paid by the Idaho mine, of Nevada County, California.....	51
Dividend-paying mines.....	235
Dodge ore concentrator.....	346
Dodge rock-breaker.....	346
Domestic production of gold and silver.....	193
Domestic production of gold and silver, 1874 to 1879.....	192
Drawback to mining in Nevada.....	91
Drift mining.....	321

E.

Eastern Oregon mines.....	118
Egypt, monetary statistics of.....	245
El Dorado County, California, condition of the mines of.....	24
Elko County, Nevada, condition of the mines of.....	91

	Page.
England, coinage in.....	307
Esmeralda County, Nevada, condition of the mines in.....	92
Estimate of the production of bullion by Mr. J. J. Valentine, of Wells, Fargo & Co.....	181
Estimate of the production of Montana.....	125
Estimated disposition made of gold and silver bullion at the mints and assay office at New York.....	214
Estimated production of California from the discovery of gold to the close of the calendar year 1880.....	311
Excelsior Gravel Mining Company, dividends paid by.....	59
Expense of working the Idaho mine, Nevada County, California.....	52
Export, average annual, of silver to India and China.....	298
Exports of gold and silver during the fiscal year 1880.....	212
Exports of domestic coin and bullion during the calendar year 1880.....	214
Exports of foreign coin and bullion during the calendar year 1880.....	214
Express shipments of bullion from Central City, Gilpin County, Colorado.....	143
Express shipments of bullion from Colorado.....	158
Express shipments of bullion from Dakota.....	163
Eureka County, Nevada, condition of the mines of.....	94
Eureka County, Nevada, production of the mines of.....	95
Eureka district, Eureka County, Nevada.....	95

F.

Famous pocket localities in California.....	344
Father De Smet Mine of Dakota, description of.....	165
France, monetary statistics of.....	240
Free gold quartz in Chaffee County, Colorado.....	153
Free milling process in Dakota.....	162, 163
French importations and exportations of gold.....	297
French importations and exportations of silver.....	297
Fresno County, California, conditions of the mines of.....	34
Frue ore concentrator.....	349
Fuel used in smelting in Utah.....	353, 355
Furnaces for smelting in Utah.....	353

G.

Galena district, Dakota, silver ores in.....	162
General statistics relating to the production of mines, transportation, smelting, refining, coinage, and export of gold and silver in the United States.....	181
Georgia, condition of the mining industry in.....	177
Gergensen's process on Big Cañon, El Dorado County, California.....	25
Germany, monetary statistics of.....	240
Gilpin County, Colorado, condition of the mines in.....	143
Gilpin County, Colorado, description of some of its mines.....	144
Gilpin County, Colorado, placer mines of.....	145
Gilpin County, Colorado, stamp mills of.....	144
Golden Smelting Company, shipments by, in 1880.....	183
Gold and silver bullion on hand at the mints and assay office at New York December 31, 1880.....	190
Gold and silver, percentage of, in Bodie bullion.....	47
Gold and silver imports and exports during the fiscal year 1880.....	211
Gold and silver imports and exports during the calendar year 1880.....	213
Gold and silver used in the Arts and manufacturers in 1879.....	202
Gold, first discovery of, in Georgia.....	177
Gold from Indiana.....	181
Gold of domestic production deposited at the mints and assay offices in fiscal year 1879.....	195
Gold of domestic production deposited at the mints and assay offices during fiscal year 1880.....	197
Gold and domestic production deposited at the mines and assay offices during calendar year 1880.....	200
Good condition of the Bodie mines.....	50
Granite Basin Quartz mines, Plumas County, California.....	72
Grant County, Oregon, condition of the mines of.....	119
Gravel crushing at Grass Valley, Nevada County, California.....	54
Gravel mines of Western North Carolina.....	171
Great Britain, monetary statistics of.....	239

	Page.
Gross yield of Nevada by counties, reported by State Comptroller, for six months ending December 31, 1879.....	108
Gross yield of Nevada by counties, reported by State Comptroller, for six months ending, June 30, 1880.....	109
Gross yield of Nevada by counties, reported by State Comptroller, for year ending June 30, 1880	109
Gunnison County, Colorado, condition of the mines of	149
Gunnison County, Colorado, discovery of carbonates in	151
Gutzkon's method of parting gold and silver	356

H.

Haile mine of South Carolina, description of	176
Handy, Parker, letter from, on consumption of gold and silver in the manufactures	204
History of mining camps in Idaho	122
Homer district, Mono County, California, discovery of	48
Homestake mills, operations of	164
Homestake mines of Dakota, description of	164
Hong-Kong and China, shipments of silver to	188
Horn Silver mine of Utah, production of	129
Hukill mine, of Clear Creek County, Colorado, description of	146
Humboldt County, California, condition of mines of	35
Humboldt County, Nevada, condition of mines of	96
Huntington's oscillating stamp mill	350
Hydraulic method of mining	316
Hydraulic mines of the Forest Hill Divide, Placer County, California	321
Hydraulic mining	379
Hydraulic mining in North Carolina	175
Hydraulic operations in Eureka Mine, Calaveras County, California	19
Hydraulic pump at Orville, Butte County, California	15

I.

Idaho, condition of the mining industry in	121
Idaho County, Idaho, condition of the mines of	124
Idaho mine, Nevada County, California, dividends paid by	51
Idaho mine, Nevada County, California, expenses of	52
Idaho mine, Nevada County, California yield of	52
Imports and exports of specie in England	296
Imports of gold and silver during the fiscal year 1880	211
Imports of gold and silver during the calendar year 1880	213
Inch of water, how estimated	320
Increased activity of silver mining at Butte, Montana	125
Increased purchases of gold dust at Sonora	84
India, monetary statistics of	240
Indiana, gold from	181
Indiana, gold deposits in Brown County	181
Inventions and improvements	345
Inventory of property of the Bonanza mines	103
Inventory of the C. and C. shaft	103
Inyo County, California, condition of the mines of	28, 30
Isabelle Works, Alpine County, California	393
Italy, monetary statistics of	242

J.

Jackson County, Oregon, condition of the mines of	119
Japan, monetary statistics of	245
Jointed structure of rocks	374
July, Leadville shipments for	138
July, production of Utah bullion for	130

K.

Kern County, California, condition of the mines of	31
Knox and Osborn Mill, Calaveras County, California	337
expense of running	339

L.

	Page.
Lake County, Colorado, condition of the mines of	134
Lander County, Nevada, condition of the mines of	97
Lane County, Oregon, condition of the mines of	119
Large ore bodies in Dakota	161
Lassen County, California, condition of the mines of	34
Lawrence County, Dakota, condition of the mines of	161
Leaching of ores	383
Lead ores rare in North Carolina	169
Leadville mines, dividends paid on	140
Leadville mining district, total production of	139
Leadville product for 1880	135
Leadville smelters, bullion produced by	136
Leadville shipments for July	138
Leadville, shipments of ore and production of bullion from	135
Ledges, silver, of Shasta County, California	75
Lemhi County, Idaho, condition of the mines of	124
Lincoln County, Nevada, condition of the mines of	98
List of dividend-paying mines	235
List of non-dividend-paying mines	237
Little Pittsburgh mine, Lake County, Colorado, condition of	140
Locality of the production of silver sold to the Treasury Department during the fiscal year 1880	190
Los Angeles County, California, condition of the mines of	31
Low grade of gold ores of Georgia	178
Lyon County, Nevada, condition of the mines of	99

M.

Maine, mining in	180
Machinery for stamping	367
Maricopa County, Arizona, condition of the mines of	111
Mariposa County, California, condition of the mines of	36
May Lundy mine, Mono County, California, ore from	49
Mear's process of chlorination	340
Mendocino County, California, mines of	33
Merced County, California, mines of	33
Merrifield Mine, new chlorination works at	57
Metallurgical centers	381
Metallurgical processes in Utah	353
Mexico, monetary statistics of	243
Mill, combined crushing and grinding	351
Mills of Georgia, description of	178
Mills, large, of Dakota	163
Mills, quartz, in Nevada County, California	51
Mills, stamp, in operation in Gilpin County, Colorado	144
Mines and mills of Colorado	132
Mines of the Appalachian Range	168
Mines of Gunnison County, Colorado, description of	149
Mines of Pima County, Arizona	114
Mines, dividend-paying	235
Mines, non-dividend-paying	237
Mining assessments	220
Mining companies, dividends and assessments of	227
Mining in Lida Valley district, Esmeralda County, Nevada	93
Miscellaneous assessments on mines	233
Modoc County, California, condition of mines of	34
Mohave County, Arizona, condition of mines of	110
Monetary statistics of—	
African States	245
Australia	239
Austria	241
Canada	239
Cuba and Hayti	244
Central America	243
Egypt	245
France	239

	Page.
Monetary statistics of—	
Germany.....	239
Great Britain.....	239
India.....	239
Italy.....	242
Japan.....	245
Mexico.....	243
Netherlands.....	242
Portugal.....	242
Russia.....	243
Scandinavian States.....	242
South America.....	244
Switzerland.....	242
Turkey.....	243
Mono County, California, condition of the mines of.....	38
Moore Smelting Works, shipments from, during 1880.....	183
Montana, condition of the mining industry in.....	125
Montana, production by counties.....	126
Mount Cory and Tarrytown district, Mono County, California, description of.....	50
N.	
Napa County, California, condition of mines of.....	33
Netherlands, monetary statistics of.....	242
Nevada, production diminishing in.....	91
Nevada City, Nevada County, California, bullion shipments from.....	58
Nevada County, California, condition of mines of.....	51
Nevada, the great absorbent of assessment money.....	232
New Chlorination Works at Merrifield mine, Nevada County, California.....	57
New England Smelting Works at Mineral King mine, Tulare County, California.....	83
New Mexico, condition of mining industry of.....	158
New "skip" at the Scotia mine, Nevada County, California.....	54
Nez Percés County, Idaho, condition of the mines of.....	124
Non-dividend paying mines.....	237
North Carolina, condition of the mining industry of.....	169
November shipments of bullion from Leadville.....	139
Nugget, California's largest.....	344
Number of records of claims in Summit County, Colorado, during 1880.....	152
Number of stamps in the Black Hills.....	166
Number of stamps in the large mills of Dakota.....	163
Nye County, Nevada, condition of mines of.....	99
O.	
Oneida County, Idaho, condition of mines of.....	124
Ore-concentrator, Blatchly's.....	350
Ore-concentrator, Dodge's.....	346
Ore-concentrator, True's.....	349
Ore from the May Lundy mine, Mono County, California.....	49
Ore on hand at Leadville at the various works, January 1, 1881.....	139
Ore purchased by the Moore Smelting Works at Golden, Colorado, during 1880.....	183
Ore supply for smelters in Utah.....	356
Oregon, base bullion.....	119
Oregon, condition of mining industry in.....	117
Oregon, production of bullion by counties.....	120
Ores of Georgia, low grade of.....	178
Ores, method of sampling in Utah.....	352
Ormsby County, Nevada, condition of mines of.....	100
Oscillating stamp mill, Huntington's.....	350
Out-put of ore from Leadville, daily average.....	136
Owyhee County, Idaho, condition of mines of.....	125
P.	
Park County, Colorado, condition of mines of.....	148
Parting gold and silver in California.....	356

	Page.
Parting gold and silver in Lautenthal.....	363
Paul's American Arastra.....	347
Pay-rolls for January, 1881, on the Comstock.....	105
Pennington County, Dakota, condition of the mines of.....	160
Pennsylvania Lead Company, business of.....	184
Percentage of gold and silver in bullion from Bodie.....	47
Pima County, Arizona, condition of mines of.....	112
Pinal County, Arizona, condition of mines of.....	111
Placer County, California, condition of mines of.....	62
Placer mines of Gilpin County, Colorado.....	145
Plattner's process of chlorination.....	340
Plumas County, California, condition of the mines of.....	67
Pocket mining and nuggets.....	342
Pocket mining, how conducted.....	344
Portugal, monetary statistics of.....	242
Precious metals, consumption of.....	205
Prices, course of.....	217
Principal mines of Custer County.....	148
Principal mines on the Comstock, depth of workings in.....	105
Processes required for working low-grade ores in Nevada.....	91
Production, domestic, of gold and silver, 1874 to 1879.....	192
Production for the calendar year 1880.....	8
Production for the fiscal year 1880.....	6
Production for the fiscal year 1880 by States and Territories.....	8
Production of Alpine County, California.....	12
Production of Arizona by counties.....	116
Production of bullion in Colorado.....	132
Production of bullion and shipments of ore from Leadville, Colorado.....	135
Production of bullion in States and Territories west of the Missouri River, estimated by J. J. Valentine, of Wells Fargo & Co.....	181
Production of California by counties.....	89
Production of the mines of California.....	90
Production of the California mine, Storey County, Nevada.....	101
Production of the Consolidated Virginia mine, Storey County, Nevada.....	101
Production of the carbonate camp for fifteen months ending April 1, 1881.....	137
Production of the carbonate camp for the first three months of 1880.....	137
Production of Colorado for 1879 by counties.....	156
Production of Colorado for calendar year 1880, by counties.....	157
Production of Colorado for calendar year 1880, by counties, an expert's guess.....	156
Production of Colorado for the fiscal year 1880, by counties.....	157
Production of Chinese at Ione and Lancha Plana, Amador County, California.....	14
Production of Clear Creek County, Colorado.....	145
Production of Custer County, Colorado.....	147
Production of counties of Nevada as reported from the mines.....	107
Production, estimated, of Colorado for 1879.....	155
Production of Eureka County, Nevada, mines.....	95
Production of Gilpin County, Colorado.....	144
Production of Leadville, Colorado, for 1880.....	135
Production, total, of Leadville mining district.....	139
Production, present, in California.....	11
Production of principal mines of Colorado.....	158
Production of Nevada diminishing.....	91
Production of the two great mines of the Comstock.....	105
Production of North Carolina.....	175
Production of South Carolina.....	177
Production of Georgia.....	180
Production of Idaho by counties.....	125
Production of Pima County, Arizona.....	112, 114
Production of the precious metals in California and improved machinery for mining and milling.....	311
Production of the precious metals in the United States in 1879.....	191
Profits of hydraulic mining.....	319
Proportions of gold and silver in bullion from the Comstock lode.....	182
Proportions of gold and silver in bullion from Nevada.....	182
Purifying and melting the gold.....	365
Purifying and melting the silver.....	364
Purifying, pressing, and melting silver.....	361

Q.

Quarterly assessment roll of proceeds from Eureka County, Nevada, mines.....	Page. 95
Quartz and placer mines of Baker County, Oregon	118
Quartz, free gold bearing, in Chaffee County, Colorado.....	153
Quartz, gold bearing, of Alaska	168
Quartz mills on the Carson River, Nevada	100
Quartz mills of Custer County, Dakota.....	160
Quartz mills in Nevada County, California	51
Quartz mills used in Georgia, description of.....	178
Quartz mining, how conducted at an early day.....	332
Quartz mining in California, commencement of	312
Quartz, sulphides in	336
Quartz veins and cement beds in Dakota.....	162

R.

Receipts of the Bonanza mines for 1880.....	102
Redstone's combined crushing and grinding mill.....	351
Reduction and refining works, amount of bullion produced by principal.....	185
Reduction of the silver sulphate	363
Reduction works at Charlotte, North Carolina	170
Refined lead produced in Utah	127
Refinery, the Germania, near Salt Lake City	354
Refining lead bullion in Utah.....	354
Report of managing director of Isabelle Gold and Silver Mining Company of Alpine County, California.....	393
Report of the Tombstone Company, Arizona	113
Reports of mines by counties in California.....	89
Rich gold-bearing quartz at Grass Valley, Nevada County, California.....	53
Richmann's rock drill and air compressor	347
Rich pockets in Kimball mine, El Dorado County, California.....	27
River and bar mining	327
Roasting concentrated sulphurets prior to chlorination.....	336
Rock breaker, Dodge's	346
Rock drill and air compressor, Richmann's	347
Rollers, Cornish, for breaking ore	369
Rudesil mine, of North Carolina, description of	170
Russia, monetary statistics of.....	243

S.

Sacramento County, California, condition of mines of	32
Salt Lake bullion shipments	131
San Bernardino County, California, condition of mines of.....	32
San Diego County, California, condition of mines of	34
San Francisco treasure shipments	188
San Juan country, condition of the mines of.....	153
Scandinavia, monetary statistics of	242
Seam diggings	344
Sedimentary rocks, silver in	384
Settling the gold and silver solution.....	358
Shasta County, California, condition of the mines of.....	74
Shasta County, California, silver ledges of.....	75
Shipments from Bodie mines, California	46
Shipments of base bullion and ore via the Central Pacific Railroad, from— Arizona	189
California	188
Nevada	189
Utah.....	190
Shipments of bullion from Colorado, by express.....	158
Shipments of bullion from— Casa Grande, Arizona.....	111
North Carolina	175
Leadville, in October.....	138
Leadville, in November.....	139
Shipments of ore and production of bullion, from Leadville	135
Shipments of gold and silver from the works of the Boston and Colorado Smelting Company, for 1880.....	183

	Page
Shipments of silver from San Francisco to Hong-Kong and China	188
Shipments of bullion from Nevada City, Nevada County, California	58
Sierra County, California, condition of the mines of	76
Silver of domestic production deposited at the mints and assay offices during the—	
Fiscal year 1879	196
Fiscal year 1880	199
Calendar year 1880	201
Silver in sedimentary rocks	384
Silver ore discoveries in Gunnison County, Colorado	149
Silver Reef bullion, Utah, shipments of	127
Silver sold to the Treasury Department during 1880, locality of production ..	190
Siskiyou County, California, condition of mines of	82
Skagit mines, Washington Territory	121
Smelters at Leadville, bullion produced by	136
Smelting works first established in Colorado	132
Solution of the alloy in parting gold and silver in California	357
Solution of the silver	363
South American States, monetary statistics of	244
South Carolina, condition of the mining industry in	176
Southern Pacific Railroad, Arizona	110
Specie money, where it is	232
Specific gravity of native California gold	342
Stamping machinery	367
Stamp-mills in Arizona	117
Stamp-mill, oscillating	350
Stamp-mills in Gilpin County, Colorado	144
Stamps in the Black Hills, Dakota	166
Stanislaus County, California, condition of mines of	32
State comptroller's report of production of Nevada mines by counties	108, 109
State Line mine, Nye County, Nevada, condition of	100
Statement of the amount of bullion used in the arts and manufactures derived from deposits at the mints and assay-offices during fiscal year 1879...	204
Statement of the amount of bullion reported as being handled by brokers during the fiscal year 1880	186
Statement of the amount of bullion transported by the Central Pacific, Virginia and Truckee, and Atchison, Topeka and Santa Fé Railroads during 1880	136
Statement of the amount of bullion and locality of production shipped by the Pacific, Wells Fargo, Southern, Sidney, and Black Hills express companies during fiscal year 1880	187
Statement of the amount of precious metals produced in the States and Territories west of the Missouri river in 1880	182
Statement of the bullion production of Leadville for September, compared with previous months	139
Statement of the business done by the Golden Smelting Company for 1880	183
Statement showing the bullion receipts and production of the Newark Smelting and Refining Company for 1880	184
Statement showing the amount of bullion and locality of production reported by reduction works	185
Statement of gold and silver on hand at the mints and assay office at New York, December 31, 1880	190
Statement of gold and silver bullion and coin on hand at the mints and United States Assay Office at New York, for the fiscal years 1879, 1880	215
Statement by countries of net imports of American silver coin for fiscal years 1878-1880	225
Statement of French importations and exportations of gold and silver	297
Statement of the production of the mines of Nevada	108
Statement by counties of the production of Nevada as reported by the mines ..	107
Statement of the production of gold and silver in Montana in 1880 by counties ..	126
Statistics of mining ditches in California	318
Steiger and Kerr's continuous discharge crushing and grinding pan	351
Storey County, Nevada, bullion tax	104
Storey County, Nevada, condition of the mines of	101
Summary of bullion production in Arizona, by counties	117
Summary of bullion production in California, by counties	89
Summary of bullion production in Oregon, by counties	120
Summit County, Colorado, condition of the mines of	152
Summit County, Colorado, description of the mines of	152
Switzerland, monetary statistics of	242

T.

Page.

Table of bars manufactured at the mints and assay offices in 1880.....	210
Table of coinage during the fiscal year 1880.....	208
Table of coinage during the calendar year 1880.....	209
Table of coinage during the calendar years 1877 to 1880.....	210
Table of domestic production of gold and silver.....	192
Table of deposits and purchases of gold and silver at the mints and assay offices during fiscal year 1879.....	193
Table of deposits of gold of domestic production during fiscal year 1879.....	195
Table of deposits of silver of domestic production during fiscal year 1879.....	196
Table of deposits and purchases during the fiscal year 1880.....	197
Table of deposits of domestic gold during the fiscal year 1880.....	198
Table of deposits of domestic silver during the fiscal year 1880.....	199
Table of deposits and purchases during the calendar year 1880.....	200
Table of deposits of domestic gold for the calendar year 1880.....	200
Table of deposits of domestic silver for the calendar year 1880.....	201
Table exhibiting the character and value of the gold and silver used in the arts and manufactures during the fiscal year 1880.....	207
Table of the production of the mines of California.....	90
Table of the production of Bodie bullion.....	44
Table of the production of the Belvidere mine.....	45
Table of the production of the Bechtel Consolidated mine.....	45
Table of the production of the Bodie Consolidated mine.....	45
Table of the production of the Bulwer Consolidated mine.....	45
Table of the production of the Dudley mine.....	45
Table of the production of the Kate Rodgers mine.....	45
Table of the production of the Mexican mine.....	45
Table of the production of the Noonday mine.....	45
Table of the production of the Red Cloud mine.....	45
Table of the production of the Sitting Bull mine.....	45
Table of the production of the Standard mine.....	44
Table of the production of the Syndicate mine.....	45
Table showing gold and silver prices of commodities exported from the United States, French exports and prices current in London.....	223
Table showing imports and exports of silver bullion and coin from January 1, 1878, to September 30, 1880.....	299
Table showing combined net movement of marketable silver in France and Great Britain from January 1, 1878, to September 30, 1880.....	301
Table showing the sources of supply and demand of the international movement of silver.....	303
Table showing specie and paper circulation of France from 1850 to 1878.....	308
Table of circulation of various countries.....	309
Table of government and bank paper issue and metallic reserves.....	310
Table showing the estimated production of California from the discovery of gold to 1880.....	311
Tabular statement showing the condition of mining in California for the fiscal year, 1880.....	313
Tailings.....	330
Tailings from the Comstock, treatment of, at the mills on the Carson River, Nevada.....	106
Tehama County, California, condition of the mines of.....	34
Telluric ores, varieties of.....	343
Telluride veins of Bourbon County, Colorado.....	147
Telluride veins of Sierra County, California.....	343
The four barren years.....	230
The two mines of the period.....	101
Theory of the formation of auriferous gravel.....	376
Timber supply of Alaska.....	168
Total production of the Bodie mines.....	46
Total production of the Bonanza mines.....	104
Total production of the Leadville mining district.....	139
Treasure shipments from San Francisco.....	188
Treatment of pot residues.....	362
Treatment of sulphate of the sesquioxide of iron.....	322
Treatment of tailings on the Carson River, Nevada.....	106
Trinity County, California, condition of the mines of.....	86
Tulare County, California, condition of the mines of.....	83
Tuolumne County, California, condition of the mines of.....	83

	Page.
Tunneling in California	393
Turkey, monetary statistics of.....	243

U.

Umatilla County, Oregon, condition of the mines of.....	119
Undeveloped Plumas gravel	73
Union County, Oregon, condition of the mines of.....	119
Utah, bullion for July	130
Utah, condition of mining industry in.....	127
Utah mines, assessments on.....	233
Utah, production for the calendar year 1880	127

V.

Value, average, of principal domestic commodities exported from the United States	219
Value and character of gold and silver used in the arts and manufactures during 1880	207
Value of imports and exports of India.....	298
Van Lennep, Mr. D., on Granite Basin, Plumas County, California.....	73
Vein mining	331
Vein mining in North Carolina limited	169
Vein mining in South Carolina	176
Ventura County, California, condition of mines of.....	34
Virgin mining ground in El Dorado County, California.....	27
Volcanic action in California	378

W.

Washington Territory, condition of mining industry in.....	120
Washoe County, Nevada, condition of mines in.....	106
Washing of the sulphuric liquors	364
Wells Fargo, estimate of production of Utah.....	131
Wet and dry stamping	370
Where the specie money is.....	232
White Pine County, Nevada, condition of mines of.....	106
Willard furnace, used by the Shawamut Company, Calaveras County, California.....	22
Williams' desulphurizing furnace.....	337
Workings in the principal mines on the Comstock, depth of.....	105
Working details of the Lautenthal process of parting gold and silver.....	366
World's production of gold and silver	294

Y.

Yavapai County, Arizona, condition of mines of	116
Yield, estimated, of New Mexico.....	158
Yield of Butte district, Montana	126
Yield of the Comstock mines	105
Yield of Eureka County, Nevada, mines.....	96
Yield of gravel per cubic yard of hydraulic mining in California	321
Yield of Idaho mine, Nevada County, California.....	52
Yield per foot of channel in ancient river mining.....	325
Yuba County, California, condition of mines in.....	88
Yuma County, Arizona, condition of mines in	116

